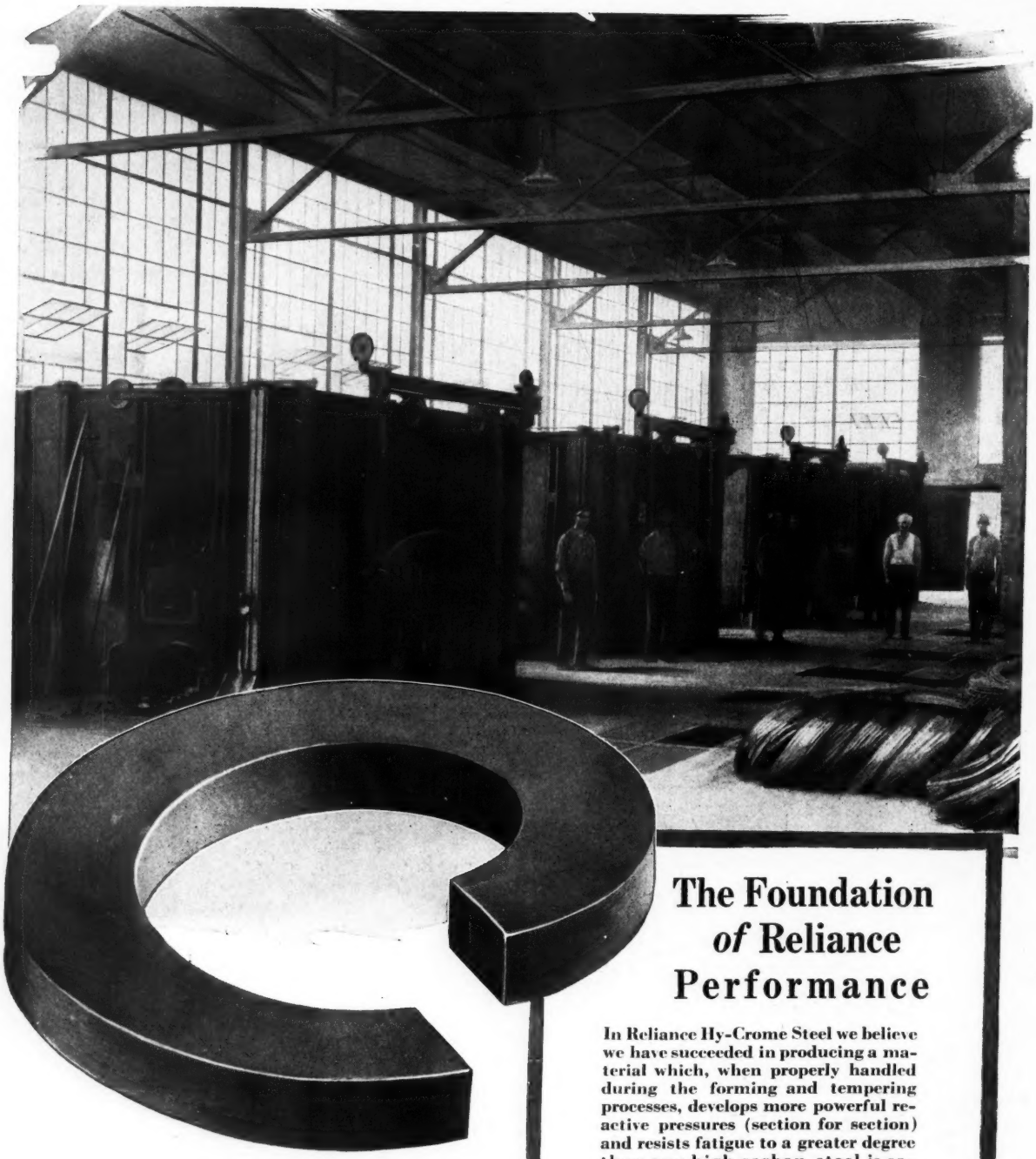
APRIL, 1923

Railway Engineering and Maintenance

HIPOWER

HIPOWERS adequately, economically and permanently maintain the bolted security of Railway Track Joints. That is why they are universally used.



RELIANCE HY-CROME NUT LOCKS

The Foundation *of* Reliance Performance

In Reliance Hy-Crome Steel we believe we have succeeded in producing a material which, when properly handled during the forming and tempering processes, develops more powerful reactive pressures (section for section) and resists fatigue to a greater degree than any high carbon steel is capable of.

We will be glad to send you sample nut locks to test.

The Reliance Mfg. Co.
MASSILLON, OHIO

SALES AGENCIES:
New York—WALKER DRAFT GEAR CO., Agents
Chicago—CRERAR-ADAMS CO., Agents
Los Angeles—K C. BANKS, Agent

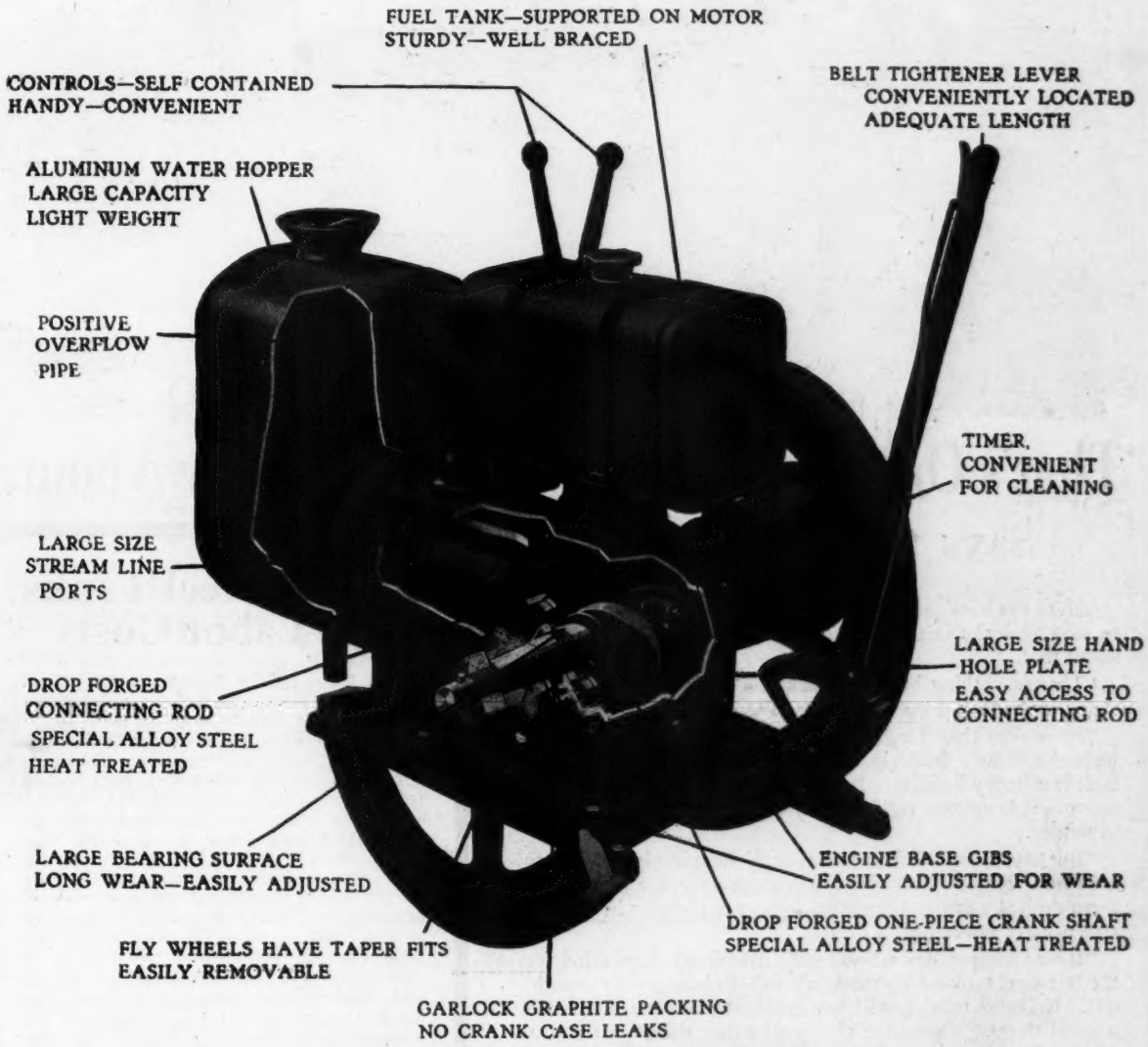
FACTORY BRANCHES:

New York	*Chicago*
Cleveland	*St. Louis*
Detroit	*San Francisco*

RAILWAY ENGINEERING AND MAINTENANCE
Entered as second-class matter June 23, 1916, at the post office at Chicago, Ill., under the Act of March 3, 1879. Published Monthly by Simmons-Boardman Publishing Company at 608 S. Dearborn St., Chicago. Subscription price, United States, Canada and Mexico, $2.00 a year; foreign countries, $3.00 a year.

MUDGE 8 H.P. Roller Bearing ENGINE

The Efficient Power Unit For Railway Motor Cars



PERFECTION OF MECHANICAL DETAIL INSURES A DEPENDABLE MOTOR

Regularly furnished with the MUDGE *"All-Service"* Section or Extra Gang Car. (Class WS-1.) Rated at 8 H.P., but capable of developing 25% above its rating. The efficient design and compact construction provide maximum power and endurance with minimum weight. It can be used to economic advantage for replacements in other cars.

Write For Descriptive Circular

Mudge & Company

Manufacturers—Railroad Equipment
Railway Exchange Bldg. · CHICAGO

Horton Tanks are now equipped with Horton ¾-inch self-supporting dome roofs.

"That's One Thing I Don't Need to Worry About,"

Says the Supervisor

"Here the boss sends out a general message to supervisors to stop all leaks in our elevated tanks—but I should worry about that.

"There's nothing but *steel* tanks on my sub-division, and they don't leak a drop and never will.

"He writes that 'Leaks are causing an appalling waste of water,' and he's dead right—I've been through it. A leaky tank is a heavy liability. It wastes water that cost money to pump. It keeps the right-of-way muddy in summer and icy in winter.

"But say, worst of all is the labor of stopping leaks. Every man hour counts these days, and what's the use of wasting them on leaky tanks when steel tanks are cheaper in the end and usually never leak a drop?

"It was a happy day when I got through my requisition for the last steel tank which made my sub-division steel throughout. No more trouble with my elevated tanks now—and it's a good thing. There are plenty of other things for me to worry about."

Horton Steel Tanks Cut Labor Costs

Steel tanks require no maintenance except painting, no repairs to tank or columns, no frost casing, no leak-stopping and no hard, expensive labor for cleaning out the tank.

Horton elevated steel tanks are practically self-cleaning. The sloping bottom causes sediment to settle in the riser. The settling basin in the bottom of the riser keeps the accumulated mud below the discharge line, and the mud is removed by merely opening the Horton washout valve. Contrast this ease of cleaning with the old-fashioned way of draining the tank and putting a gang of men at work removing the accumulated mud from the tank bottom and disposing of it.

In other ways, too, the advantages are all with Horton *steel* tanks. Steel tanks cost less in the end, are rot-proof, leak-proof and fireproof, keep the water cleaner and thus reduce boiler washing and foaming, are water tight, can be moved from one location to another either knocked down or as a whole, are trim-looking and afford the best in practical permanency.

Write today for catalog 63

Replace with Steel in 1923

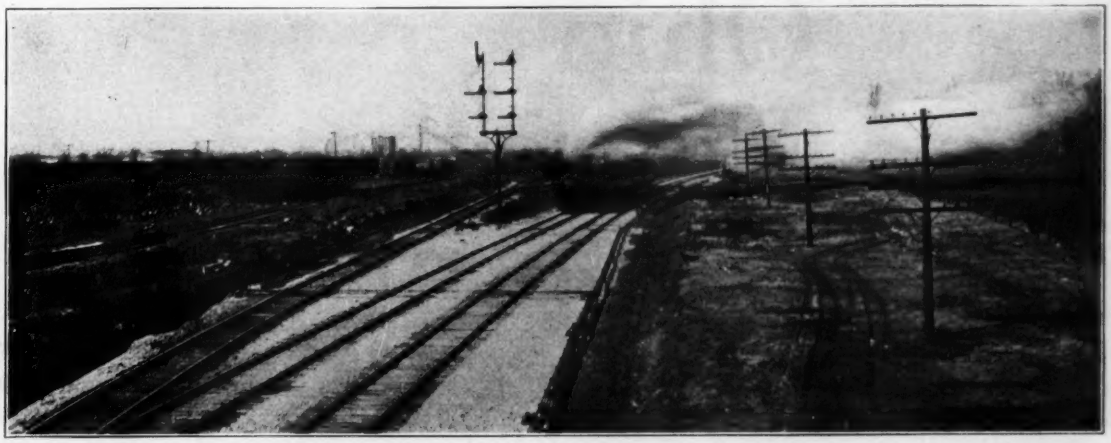
41

CHICAGO BRIDGE & IRON WORKS

2452 Transportation Bldg. CHICAGO | **3156 Hudson Terminal NEW YORK** | **1036 Forsyth Bldg. ATLANTA** | **1646 Praetorian Bldg. DALLAS** | **1007 Rialto Bldg. SAN FRANCISCO**

1151 Bank of Toronto Bldg., MONTREAL

HORTON TANKS



A Double Track Section on the Big Four.

Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

Vol. 19 April, 1923 Number 4

TABLE OF CONTENTS

Editorials 141
Letters to the Editor 143
New Books 144
Handling Concrete With Motor Cars 145
The Care of Station Grounds; W. D. Newell 148
Do You Ever Develop Your Thoughts? Walter S. Lacher 149
Keeping Bridges Clear of Drift 150
Building a Fill Without a Trestle; C. K. Canard 151
Union Pacific Enlarges Water Plant for Pocatello Terminals 153
A Permanent File for Engineering Articles; A. F. Ganier 155
Creosoted Bridge Withstands Fire 156
How the Pennsylvania Settles Disputes With Its Employees; Leo I. Kennedy 157
Track Forces Face Spring Program of Work; J. W. Griffith 158
Creosote Shortage Tends to Curtail Preservation of Wood; C. M. Taylor 159
Some New Facts About Quick Setting Cement 160
Producing Ties for Maximum Service 161
Canadian Railway Association Issues Motor Car Rules 162
Old Roofs Afford Interesting Study 163
What's the Answer? 164
New Devices 167
The Material Market 170
General News 171

WOULD YOU LIKE TO KNOW

What is a good way to keep station grounds clean?

How can motor cars be used in handling concrete?

What is the present tendency in the price of scrap rail?

Are duplicate pipe lines ever justified?

How can the creosote shortage be met?

Answers to these and other practical questions will be found elsewhere in this issue.

Edward A. Simmons, *President*
L. B. Sherman, *Vice-President*
Henry Lee, *Vice-Pres. and Treasurer*
Samuel O. Dunn, *Vice-President*
C. R. Mills, *Vice-President*
Roy V. Wright, *Secretary*
F. C. Koch, *Business Manager*

Elmer T. Howson, *Editor*
Walter S. Lacher, *Managing Editor*
Milburn Moore, *Associate Editor*
David A. Steel, *Associate Editor*
H. F. Lane *Associate Editor (Washington, D. C.)*

Published on the last Thursday preceding the date of issue by the

Simmons-Boardman Publishing Company, Transportation Building, Chicago, Ill.

NEW YORK: Woolworth Building CLEVELAND: 4300 Euclid Ave. LONDON, England: 34, Victoria St., Westminster, S. W. 1
CINCINNATI: First National Bank Building WASHINGTON: Home Life Bldg. Cable Address: Urasigmec, London
NEW ORLEANS: Maison Blanche Annex

Entered at the postoffice at Chicago, Ill., as mail matter of the second class.

Request for change of address should reach us two weeks before the date of the issue with which it is to go into effect. It is difficult and often impossible to supply back numbers to replace those undelivered through failure to send advance notice. In sending us change of address please be sure to send us your old address as well as the new one.

Subscription price in the United States, Canada and Mexico $2.00 per year; foreign countries $3.00. Single copies, 35 cents. Foreign subscriptions may be paid through our London office (34, Victoria Street, S. W. 1) in £-s-d.

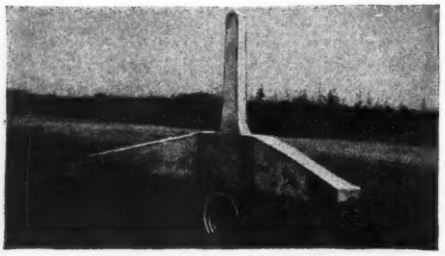
WE GUARANTEE, that of this issue 8,750 copies were printed; that of these 8,750 copies, 7,965 were mailed to regular paid subscribers, 10 were provided for counter and news company sales, 65 were mailed to advertisers, 10 were mailed to employees and correspondents, and 700 were provided for new subscriptions, samples, copies lost in the mail and office use; that the total copies printed this year to date were 35,400, an average of 8,850 copies a week.

Railway Engineering and Maintenance is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulation (A. B. C.)

Ohio
Nebraska
California
—and ARMCO CULVERTS

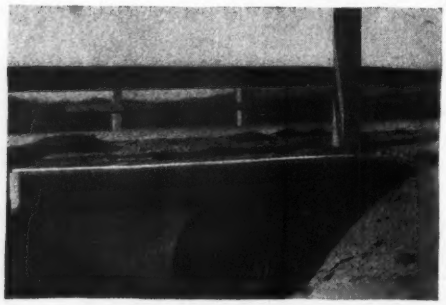
This Ohio culvert is unimpaired after 12 years under the Dixie Highway

Ohio In one of the most important counties in Ohio, no small cross drainage structure other than an Armco Culvert has been used for the last twelve consecutive years.



A typical Nebraska installation, under the Lincoln Highway

Nebraska At a recent letting in Nebraska of nearly 20,000 ft. of culvert, in sizes from 18 in. to 48 in.—65% of this total—13,000 ft. in all were assigned to Armco Culverts.



This typical California installation shows no sign of impairment after 13 years

California Over 500,000 feet of corrugated culvert have been purchased by the State Highway Commission alone in the past ten years (a small part of the total used in California). 70% of these Culverts have been under *permanent* roadways.

TRADE MARK ARMCO Ingot Iron

There is a manufacturer in nearly every state, and in Canada, making genuine rust-resisting ARMCO CULVERTS and other products of Armco Ingot Iron such as flumes, siphons, tanks, road signs, roofing, etc. Write for full information and nearest shipping point on products in which you are interested.

ARMCO CULVERT & FLUME MFRS. ASSN.
215 NORTH MICHIGAN AVE. CHICAGO

Decidedly—a great improvement is the new Wood's "STEP" Shovel

—makes the blade stronger and stiffer
—easier on the feet

GIVE this newest Wood's Mo-*lyb*-den-um Shovel to the gang. Watch its enthusiastic reception. And as the days pass, note the increased work each man does, unconsciously.

The "Step," or turned-over edge, on this new shovel is an innovation. It strengthens the blade. It gives a greater purchase to the foot—eliminates that soreness often caused in wet weather by constantly pushing the foot on a comparatively sharp edge.

This new shovel is a Mo-*lyb*-den-um shovel. You know what that means. Two to six times longer wear than any other shovel made. The exceptional toughness, strength and lasting qualities of Wood's Mo-*lyb*-den-um Steel Shovels have been proved time and again by countless tests—tests that only these shovels were able to complete.

You will undoubtedly want immediate information about this new "Step" shovel. Write us to-day about its application to your needs.

THE WOOD SHOVEL AND TOOL COMPANY
Piqua, Ohio, U. S. A.

Wood's Mo-lyb-den-um Shovels
The American Super Steel

AIRCO
DAVIS
APPARATUS
DAVIS-BOURNONVILLE CO.

ANYTHING AND EVERYTHING
FOR OXYACETYLENE WELDING AND CUTTING

Airco-Davis-Bournonville
No. 146 Welding Torch

The remarkable progress of the oxy-acetylene industry is widely attributable to the consistent development of the Airco-Davis-Bournonville Torch and the service back of it.

Write for Airco booklet:
"Anything and Everything for Oxyacetylene Welding and Cutting"

AIR REDUCTION SALES COMPANY

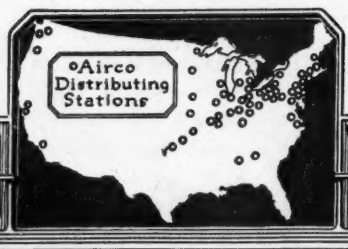
Manufacturer of Airco Oxygen — Airco Acetylene — Airco-Davis-Bournonville Welding and Cutting Apparatus and Supplies, Acetylene Generators, and Specially Designed Machines for Automatic Welding and Cutting— Nitrogen, Argon and other Airco Atmospheric Gas Products

Controls the manufacture and sale of National Carbide

Home Office: 342 Madison Avenue, New York, N. Y.

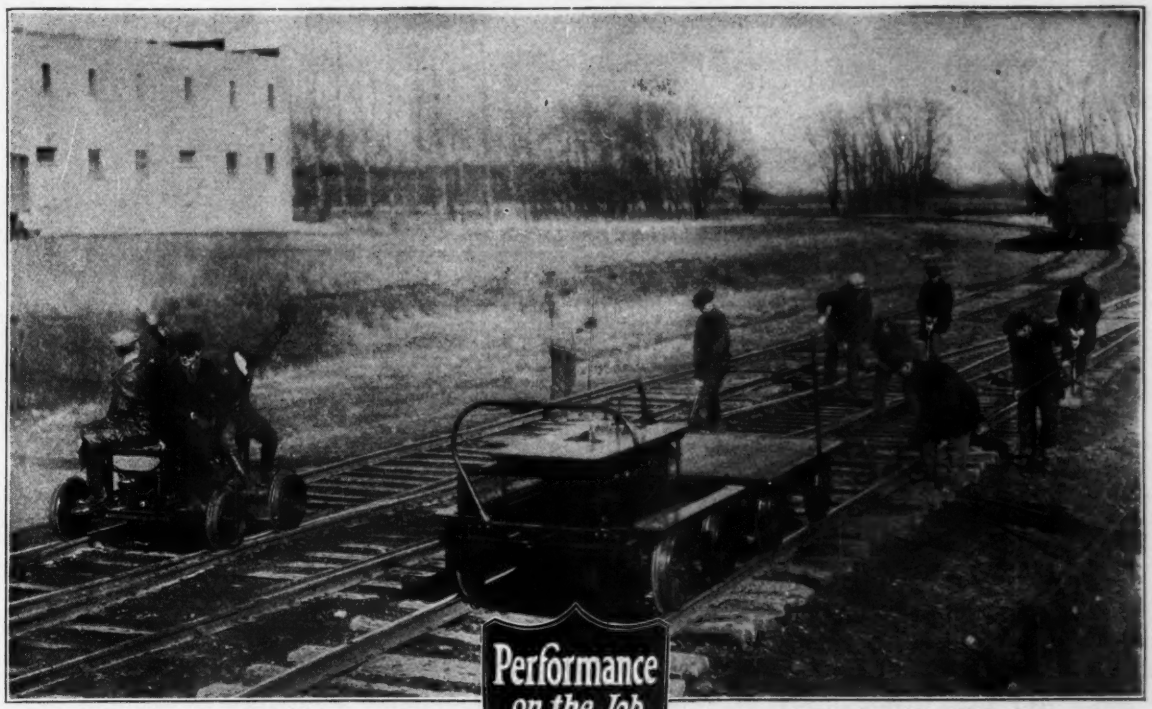
Airco District Offices, Plants and Distributing Stations conveniently located throughout the Country.

Air Reduction Sales Company maintains its own Apparatus Repair Shops in Airco District Office cities.



"Airco Oxygen and Acetylene Service is Good Service."

SERVICE ECONOMY



Inspection Car—M19

Performance on the Job Counts

Section Car—M2, with Trailer

A Railroad Manager Says—

"The remarkable thing about this investigation (of railway motor cars) is not alone the conclusive proof of Fairmont's superior performance, but the equally conclusive evidence of Fairmont's popularity with the men.

"Every section foreman on our lines swears by the Fairmont and will fiercely defend it against all others. And the roadmasters share this feeling, with the added conviction that popular equipment begets increased economy of operation and stabilized labor.

"It doesn't stop there. The division officials, ever watchful of the morale of their forces, yet alert to enforce every known economy, find Fairmonts the logical recommendation—popular equipment for the men, low cost and efficient equipment for the road."

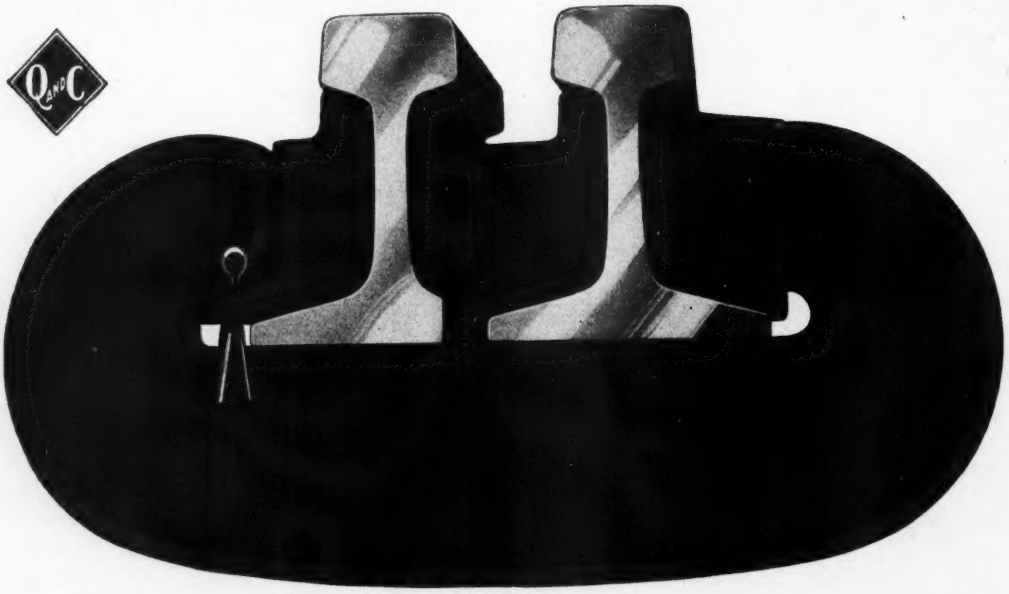
This quotation from an actual interview with a nationally prominent Railroad Manager, is not merely an isolated example of preference for Fairmont Railway Motor Cars, but is typical of the entire industry. Railroads everywhere who keep accurate cost records, and who value the opinions of their men, usually choose Fairmonts.

FAIRMONT RAILWAY MOTORS, INC., FAIRMONT, MINNESOTA

Descriptive Bulletins of Entire Line Supplied at Your Request

Fairmont

Ball Bearing Motors and Railway Motor Cars



For Every Maintenance of Way Official

We have strengthened the Q & C Universal Guard Rail Clamp throughout and we invite your requests for blue prints and literature on the improvements.

THE Q & C COMPANY, 90 West Street, New York City
CHICAGO ST. LOUIS

HE CAN'T EAT IT!

Corrosion has no effect on small McWane pipe, for it is **Cast Iron.** Equipped with the McWane Precalked Joint, or threaded Cinder-proof. Used by leading railways. Sizes 1¼, 2, 3, 4 and 6 inches.

Get booklet R.

McWANE CAST IRON PIPE CO.
Birmingham, Ala.

Headley Number 1

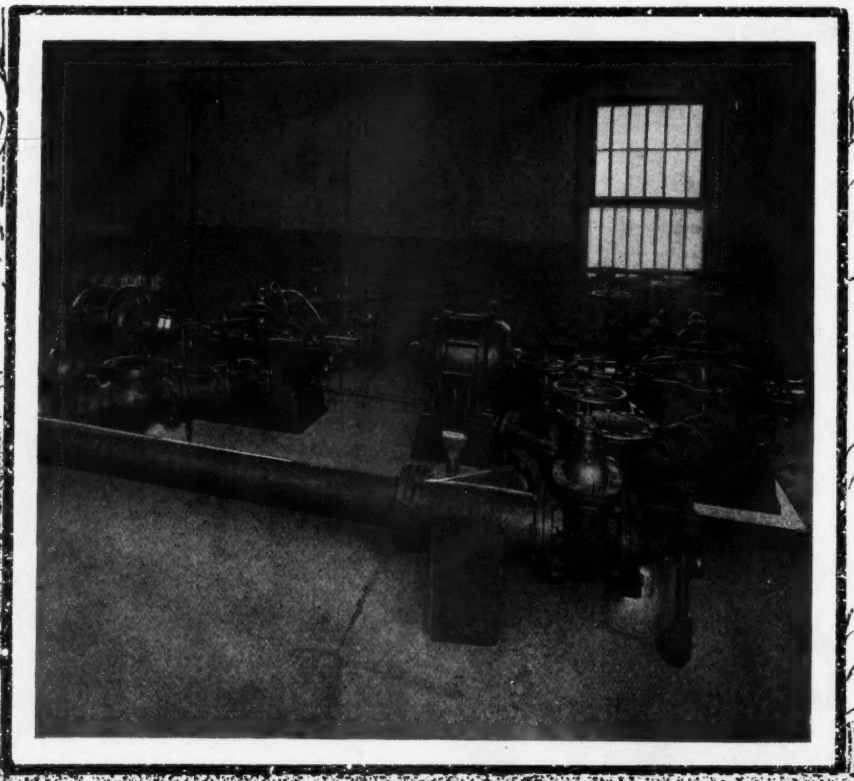
CROSSINGS
and
STATION PLATFORMS

Write for Particulars and Booklets

HEADLEY GOOD ROADS CO.
Franklin Trust Bldg., Philadelphia, Pa.

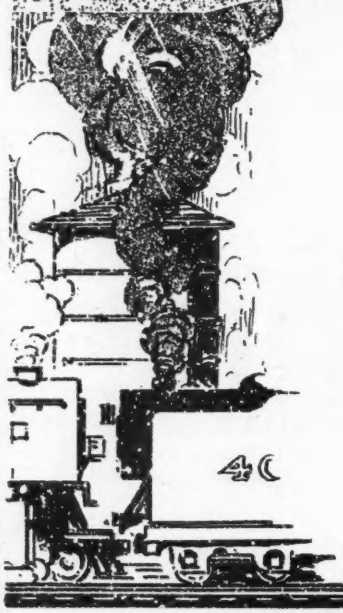
BRANCH OFFICES:
St. Louis, 1946 Railway Exchange Bldg.
Chicago, 409 Monadnock Block Building
West Medford, Mass., 37 Prescott Street
Indianapolis, Ind., 911 Hume-Mansour Bldg.

1/3 more per dollar
THE most significant evidence of the success of our new explosive, Dumorite, is the increase in volume of sales and the very large proportion of repeat orders.
The reason is simply this—it cuts blasting costs. It runs 135 or 140 sticks to the case as against 100 sticks of "40%", shoots with it, stick for stick, and costs the same per case.
It will pay you to investigate. Write our nearest branch office.
NON-HEADACHE
DU PONT
NON-FREEZING
DUMORITE
THE LATEST OF A COMPLETE LINE OF DU PONT EXPLOSIVES
Nitroglycerin, ammonia, gelatin and other types of explosives designed to meet every blasting requirement at least expense.
Branch Offices:
Birmingham, Ala.
Boston, Mass.
Buffalo, N. Y.
Chicago, Ill.
Denver, Colo.
Duluth, Minn.
Huntington, W. Va.
Kansas City, Mo.
E. I. DU PONT DE NEMOURS & CO., Inc.
Explosives Department
WILMINGTON, DELAWARE
Du Pont Products Exhibit, Atlantic City, N. J.
Branch Offices:
New York, N. Y.
Pittsburgh, Pa.
Portland, Ore.
St. Louis, Mo.
Springfield, Ill.
San Francisco, Cal.
Scranton, Pa.
Seattle, Wash.
Spokane, Wash.



AMERICAN

TRADE MARK REGISTERED U.S. PAT. OFFICE



$2400 a Year Saved in Pumpers' Wages Alone

This pumping station installation, made by The American Well Works at Kankakee, Illinois, for the Illinois Central Railroad, replaced a steam pumping plant that required the services of three attendants working in eight-hour shifts.

The American Well Works' installation being automatically controlled—only one man is required as attendant now—and the installation consequently has resulted in saving the Illinois Central Railroad $2400 a year in wages alone.

The water for the three locomotive supply tanks which this station supplies is pumped from the Kankakee River by two five-inch American Centrifugals direct connected to 25 H. P. 1800 R. P. M., G. E. Motors, automatically regulated by the Sundh control panel.

Data on the savings and cost per thousand gallons of water pumped, as well as figures on labor saved, will interest you. We'd like to send you comparative costs—ask us for them.

THE AMERICAN WELL WORKS

General Office and Works
AURORA, ILL.

Chicago Office
FIRST NATIONAL BANK BLDG.

Save Time in filling your tenders
Prevent damage from Water Hammer

WITH THE
POAGE Style H WATER COLUMN

An Instantly Adjustable Spout

Quicker work in filling tender tanks is possible with the Poage Style H Water Column equipped with the Fenner drop spout.

A vertical range of five feet and a lateral range of three feet make accurate spotting of the tender unnecessary.

The spout works equally well with tenders of different heights.

The spout avoids the usual winter troubles in cold climates. It has a non-freezable telescopic joint. This is entirely open. There is no packing of any sort. Yet it does not leak or waste a drop of water.

Quick Closure Without Water Hammer

Even on high pressure water mains, the Poage Style H Valve is closed quickly without danger to the mains from water hammer. The flow is cut down 85 per cent very rapidly and the remaining 15 per cent more slowly.

Tests by the University of Illinois have shown that this principle provides the quickest closure and makes water hammer impossible.

Investigate the Poage Style H water column. Give it a thorough trial.

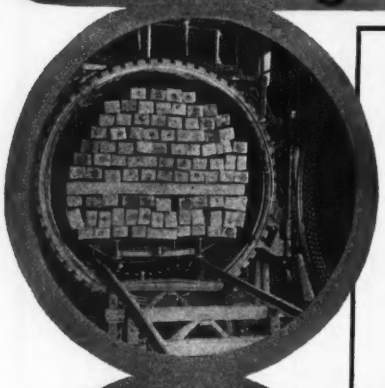
Manufactured exclusively by

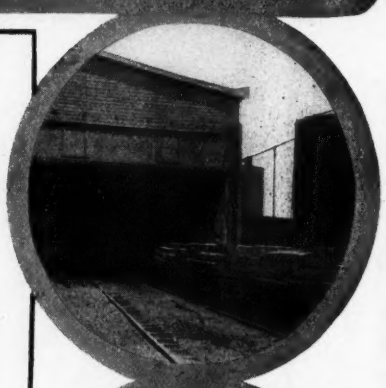
The AMERICAN VALVE & METER CO.

Cincinnati, Ohio

The International Tie

Thorough In Every Detail





Uniform In Production

International Ties are produced by experienced timber men who have been educated to make ties in strict accordance with A.R.E.A. specifications.

Uniform In Inspection

International Ties are inspected by high grade timber men who enforce the A.R.E.A. specifications rigidly and grade the ties strictly in accordance with them.

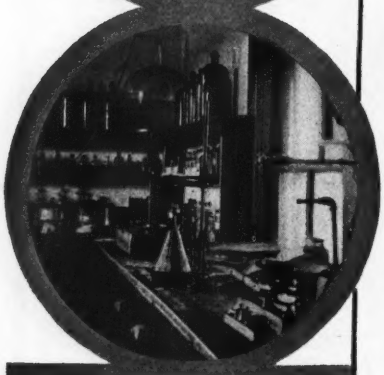
Uniform In Treatment

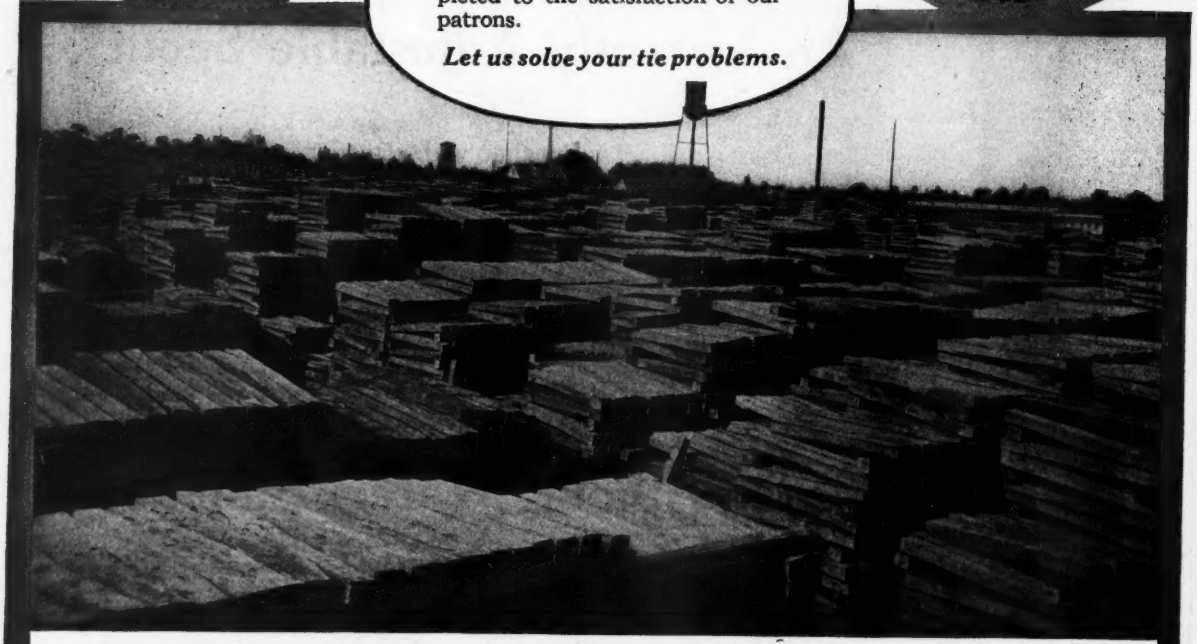
International Tie Treatment is under the personal supervision of men who have made a life study of timber and its treatment. Modern mechanical devices and high grade preservatives result in proper treatment.

Uniform In Satisfaction

International Contracts are completed to the satisfaction of our patrons.

Let us solve your tie problems.

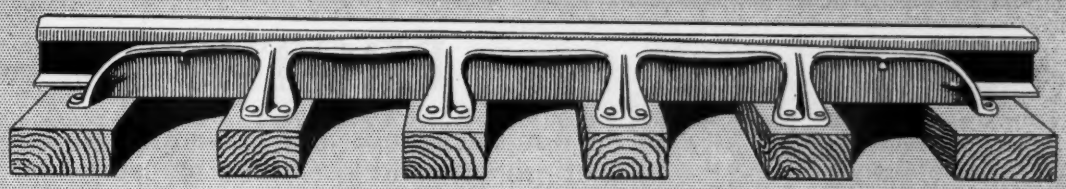




International Creosoting & Construction Co.

General Office—Galveston, Tex.

Plants: Texarkana, Texas Beaumont, Texas Galveston, Texas



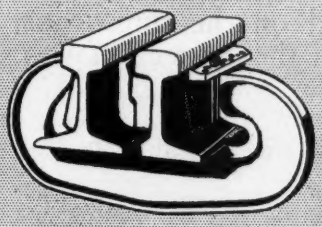
AJAX MANGANESE STEEL
ONE-PIECE GUARD RAIL

Ramapo and Ajax specialties have been long and favorably known under their individual names as manufactured by Ramapo Iron Works and Ajax Forge Company. These two companies are now consolidated into Ramapo Ajax Corporation, with five completely equipped works conveniently located for prompt deliveries to the railroads of the country. To assure service in the Western territory a stock of Ramapo Automatic Safety Switch Stands is carried at the Chicago headquarters.

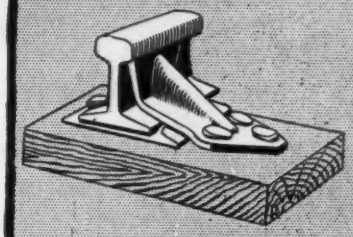
The Ramapo improved No. 20-B stand, placed on the market a year ago, has met with pronounced success. Repeat orders are coming in wherever it has been installed.

Other "RACOR" specialties not here illustrated include Switches, Frogs, Crossings, etc., Special Railway Track Work, Cast and Rolled Manganese Rail Construction, etc.

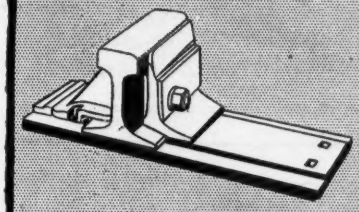
Particular attention is directed to the Ajax One-Piece Guard Rail at top of this page. Its combined simplicity and rigidity make this the most efficient and economical installation.



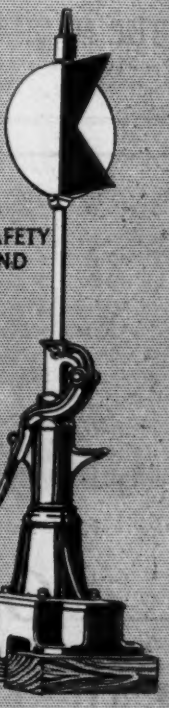
RACOR FORGED
HEAVY DUTY
GUARD RAIL CLAMP



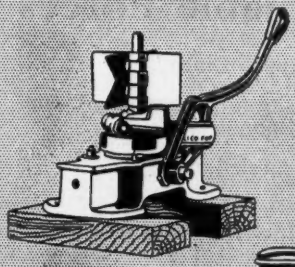
RACOR
FORGED RAIL BRACE



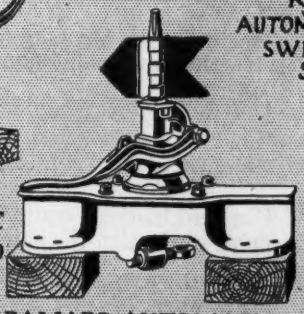
RACOR DOUBLE SHOULDER
SOLID BOTTOM
SWITCH RISER PLATE



RAMAPO
AUTOMATIC SAFETY
SWITCH STAND
Style No. 17



RAMAPO AUTOMATIC
SAFETY SWITCH STAND
Style No. 20-B



RAMAPO AUTOMATIC
SAFETY SWITCH STAND
Style No. 19

RAMAPO
AUTOMATIC SAFETY
SWITCH STAND
Style No. 18

RAMAPO AJAX CORPORATION

HILLBURN · NEW YORK

This Company is a consolidation of Ramapo Iron Works and Ajax Forge Co.

2503 Blue Island Ave.
CHICAGO

Mc Cormick Building
CHICAGO

30 Church Street
NEW YORK

NIAGARA FALLS, N.Y.
SUPERIOR, WIS.

Canadian Ramapo Iron Works, Ltd., Niagara Falls, Ont.

DURABLE

PROTECT

Your track ends and prevent destruction of property and loss of life by using

DURABLE or ELLIS BUMPING POSTS

The DURABLE freight or passenger post is easily installed on the threstle or ground and gives you the protection you require.

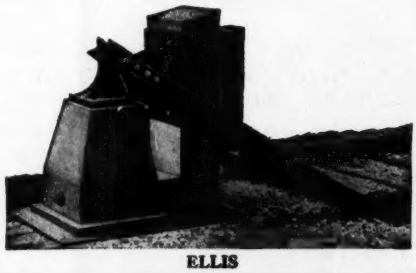
For over twenty years, under every condition of climate and installation, the ELLIS post has proven its superiority.

Where can you buy such positive insurance at such a low cost?

Manufactured and Sold by

THE MECHANICAL MANUFACTURING COMPANY

CHICAGO, ILL.



ELLIS

¾-yd. Heavy Duty Ditching Right-of-way

OSGOOD

HEAVY DUTY

RAILROAD DITCHERS

Labor saving machinery is now receiving much attention and OSGOOD Ditchers are among the leaders. They not only save labor, but time. Fewer men can do more work with an Osgood. Its ready convertibility makes it useful on the road, and in the yard as a crane or clamshell as well as a ditcher.

Ask for our Ditcher Bulletin.

The OSGOOD Company
Marion, Ohio, U. S. A.

A Larger Output *with* Available Forces

1923 will see a shortage of labor.

The railways have large programs of construction and maintenance work.

This work must be carried on.

How?

THERE IS ONLY ONE ANSWER

Use mechanical equipment to accomplish more work with the same number of men;

And—Devices that will release forces for other work.

Railway Engineering and Maintenance

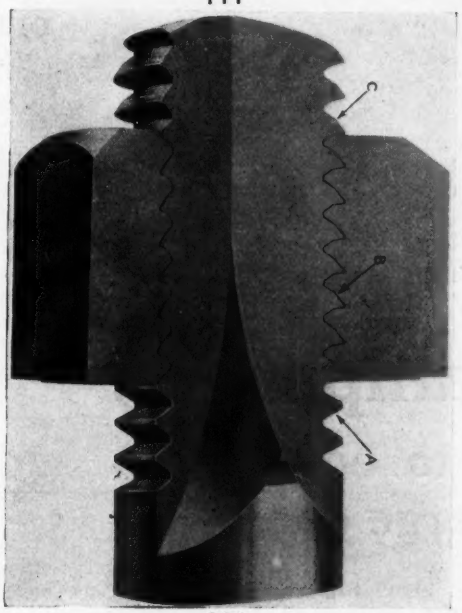
will furnish suggestions **how** to use mechanical equipment to the best advantage;

And—Enable the manufacturer, through the use of its advertising pages, to show the railway officer where such devices and equipment can be obtained.

Ask

Railway Engineering and Maintenance

Selflock Nuts Obtain the Maximum Service from Every Bolt



The best bolt in the world is only as efficient as the nut used with it.

Selflock Nuts bring the potential qualities of the best heat treated bolts into service.

With every thread locked as shown in the cut, Selflock Nuts remain locked to the elastic limit of the bolt.

We are in a position to supply all standard types and sizes of bolts with *Selflock nuts.*

Ask us to hold some difficult place tight.

Selflock Nut & Bolt Co., Inc.

East Syracuse, N. Y.

Pneumatic Tie Tampers—

Enable small gangs to equal the work output of large ones

Four men with Ingersoll-Rand Pneumatic Tie Tampers can tamp more track in one day and do a better job than twelve (12) to sixteen (16) men with hand picks and bars.

Furthermore, pneumatic tampers make a smoother, safer, and a more permanent roadbed that holds up over twice as long as hand tamped track.

Pneumatic Tie Tampers have demonstrated the ability to save labor and reduce costs for hundreds of users on all types of railroads, from the small feeder roads to the great trunk lines. Actual working figures on such installations are available and show positively the savings effected by Ingersoll-Rand Pneumatic Tampers.

Ask for copies of these reports.

INGERSOLL-RAND COMPANY, 11 Broadway, New York

Offices in all principal domestic and foreign cities

For Canada refer Canadian Ingersoll-Rand Co., Limited, 260 St. James St., Montreal

Ingersoll-Rand

18o-T

Railway Engineering and Maintenance

Volume 19 April, 1923 No. 4

MAKE A PROGRAM

NO SINGLE measure contributes more to maximum production than an orderly program. This applies alike to a railway system, a division, or an individual gang. Officers in charge of these respective units have no more important responsibility than to plan the work of their forces in detail sufficiently in advance that there may be no lost motion or waiting for the next job to develop. While many of the losses from this cause are not apparent, they aggregate large in a season and not only add to the cost but reduce the work which can be done.

There is no better indication of the executive ability of any man than his power so to organize his work that it may proceed smoothly and continuously from one operation to another. Through its absence losses will creep in which are greater than can be overcome by the application of pressure to "speed up" work. That work is performed most inefficiently where the officer in charge has not taken the time to plan it in advance and to anticipate and forestall causes for delays. That officer, whether he be a foreman or an engineer maintenance of way, will complete the largest amount of work with the least amount of extra exertion, who knows what the next task for his force is well in advance of the completion of the one on which it is now engaged, and who adopts the necessary measures to inform his men so that they likewise can plan accordingly.

MAKE THE EQUIPMENT WORK

IT IS becoming increasingly evident that the season now opening will witness one of the most acute shortages of labor ever experienced by the railways in this country. Even before the highway and other seasonal construction programs are fairly launched there is a cry of inadequate forces. This makes it more necessary than ever for the railways to install at once every form of mechanical equipment which will aid production, and equally or more important that this equipment shall be employed in the way that will secure the best results. The follow up is fully as important as the purchase. It is primarily a problem of education and supervision. Its necessity is indicated by the experience of one road which, after making a large investment for mechanical equipment of demonstrated merit, found it so difficult to get its forces to use it regularly that it repainted this equipment a less conspicuous color in order that its idleness might not be so conspicuous to passersby.

Railway organizations are so large and the tendency to follow past practices is so hard to overcome that constant education and supervision are required not only to secure an adequate return from the investment and the savings which this equipment can and should afford, but also to enable that work to be done which can be completed this year only by these mechanical aids. Engineering and maintenance of way officers cannot afford to adopt a neutral attitude, for they have an equal or greater interest than the manufacturers in making equipment of this kind a success at this time when it offers the only chance for the completion of the season's program.

WORK WITH THE HIGHWAY ENGINEER

THE national highway construction program has involved the railroads in a multitude of problems among which one of the most common concerns the grade of the track at the crossing, which becomes definitely fixed once the new highway is built. This was not the case with the highway of the past since its grade was of relatively minor importance and the nature of the roadway was such that the grade track could be raised or lowered with little disturbance of the public road. However, the modern type of highway brings a permanent construction up to the ends of the ties and the grade of the highway is established with that of the track as one of the determining points.

The usual procedure with the highway engineer is to assume that the top of the rail at the crossing is a fixed elevation and lay out his highway grade on the basis of that elevation with the result that the railroad has no chance to make a further ballast raise, unless the railway maintenance officer has the foresight to anticipate this and advise the highway engineer accordingly. In many cases railroads have learned of the contemplated highway work in time to arrange for the paving to be constructed several inches above the existing level of the top of rail, delivering enough material at the crossing to raise the track to the new level with a reasonable runoff pending the definite reballasting program. There would appear to be an opportunity here for closer co-operation between railroad and highway officers for the purpose of anticipating the requirements at the various highway crossings in order that grades may be established on a basis that best meets the needs of both parties to the crossing.

STUDY TIE PURCHASING METHODS

THE greatest handicap imposed on those engaged in the production of cross ties is the wide fluctuation in the volume of purchases by the roads from year to year. The effects of this condition are evidenced in a striking manner at the present time. After withdrawing from the market in large measure last year, the roads are now endeavoring to buy greatly increased quantities with the result that the tie market is rapidly approaching a state of demoralization. Grades are being forgotten in many areas in an effort to get ties, with the result that inferior ties are being accepted and will soon go into the track. At the same time prices are rising rapidly and the roads are paying much more than would be necessary if an orderly program prevailed from one year to another.

Engineering officers are giving close attention to the preparation of specifications for rail, to the design of frogs and switches, and to the selection of other materials in order to secure the maximum service. For the same reason they should give close attention to the selection of the grade of ties which will give them the best results and to their purchase in the way that will effect the greatest economies. The unsatisfactory conditions which now prevail in the tie market, affecting both the quality of ties secured and the prices paid for them, are due in no small measure to the fact that engineering and maintenance of way officers have not interested themselves sufficiently in tie purchases.

THE RAILWAYS AND AMERICANIZATION

DURING the war much attention was given to the Americanization of aliens within our borders and numerous programs were launched to teach immigrants the principles of our government and acquaint them with our standards of living. While there are numerous evidences that this work is still as important as ever, interest has tended to lag as the war crisis has passed. This is unfortunate.

The railways are among the largest employers of foreign labor. In many cases, particularly in the east and the southwest, track gangs are composed almost entirely of aliens and it is among these men that large opportunities exist for educational work. Many industries have conducted highly constructive programs in this direction. Conspicuous among these industries is a group of six large public utilities operating in the central west, known as the Insull group. These utilities have conducted such an active Americanization program that only 51, or less than one-fifth of one percent, of the more than 24,000 employees are not now citizens or have not taken out their first papers. That such a program is applicable to the railways is demonstrated by the fact that one of these utilities is an interurban railway, practically all of whose track employees are of foreign birth and were hired through labor agencies in the usual manner. As described in our January issue night classes were organized for these men and they are schooled in the rudiments of our language and of citizenship, with the result that only 32 out of the total 1,350 employees of this road are not now citizens or have not taken out their first papers and 20 of these expect to be ready to apply for their first papers soon.

This is a work which deserves greater consideration on the part of the railways. It is not only a civic duty of primary importance but it yields a direct return to the employer in more satisfied, efficient employees. The initiative for such work must come largely from those maintenance of way officers who are brought into closest contact with these men and who are responsible for the efficiency with which their work is conducted.

TWO KINDS OF BOSSES

Good wages, a steady job and good working conditions do not of themselves bring loyalty and interest to a job. The key to the problem of mutual relations in industry is the state of mind. In businesses like yours and mine the average worker never sees the chief executives. He judges them by the sample he has seen and his sample is his immediate superior. If his boss is of the kind who, as soon as he is appointed to this position—even a straw boss—begins to blow up like a pouter pigeon and thinks, "Well, here I am, a devil of a fellow" and who, for fear that everyone will not recognize this fact, begins to drive and worry the men, they will not have a lot of respect for him and will not break their backs to help him carry the load. On the other hand if the boss is a human and red-blooded fellow who takes an interest in his men, his men will say, "That fellow is all right. we'll go through hell for him," and will also assume that the big bosses probably are also all right.—*From an address before the New York Railroad Club, February 16, by E. K. Hall, vice-president of personnel and public relations, American Telegraph and Telephone Company.*

THERE IS STILL ROOM FOR IMPROVEMENT

FOR many years concrete construction methods and equipment saw their greatest development in multiple story building construction. Nearly all concrete buildings follow so nearly the same general plan that methods and equipment devised for use on one building may be applied to another with little or no modification. It was in such structures that unit form work received its greatest impetus and the elevating tower and spouting found their most ready application. More recently the national campaign for concrete road building has led to the introduction of equipment of an entirely different kind, but the work has been conducted on such an immense scale that even though it involves essentially new methods that have no counterpart in the older classes of concrete work, the development of both methods and machinery for road construction have reached a high degree of refinement in a relatively short time.

Not so with railway concrete work. A considerable part of the railroad work comprises small units that do not warrant extensive concrete plants. A good mixer with facilities for using barrows, buggies or cars for transporting the materials and the concrete are all that can be justified in the way of equipment. Development here will be directed primarily toward the use of better machinery of the more simple types.

The larger projects are of such a varied nature, are conducted under such differing conditions and are usually circumscribed by such narrow confines of space that each project becomes a special problem. Moreover they usually differ so greatly from the ordinary building or bridge work as to entail the planning of a special plant in which such standard concrete equipment as may be obtained from the manufacturer is utilized as best it may to meet the special requirements.

In certain classes of railroad work considerable progress has been made in the development of equipment peculiarly adapted to a special purpose. Thus the pneumatic process of mixing and transporting concrete has had intensive application in the lining of railroad tunnels and track elevation work has produced the car-mounted mixer plant, used most extensively in Chicago, but even with these developments the progress is still in the stage where almost every new piece of equipment built embraces features differing from those prevailing in the earlier designs. In other words, there is still room for considerable development.

In the main these problems have been solved by railway men themselves with the display of no little ingenuity, an illuminating example of which is to be found on another page in this issue. But, there would seem to be an opportunity for further development in which co-operation between the manufacturer and the railway construction engineer would play an important part. It is

here that the manufacturer's representative, if of the type characterized by experience in construction practices rather than in salesmanship, can be of unquestioned assistance to the officer in solving these problems.

MAKING LIFE WORTH WHILE

THE population of the world includes certain elements which have been herded in the slums of great cities for so many generations that they seem to thrive best in the most sordid surroundings. But the great majority of the people in this country are the descendants of American farmers or the rugged peasantry of Europe, whose close contact with the beauties of open air life in a world of trees, green grass, gardens and fields of grain, has inbred such a desire for these things that happiness is virtually unattainable without them. Indeed, the unrest in our great industrial centers arises in part from the ugliness of the surroundings in which the employee must work and live. It is in an effort to satisfy this hunger for the world as nature made it that the cities have developed their wonderful park systems with which we are familiar today.

Most railway employees, and particularly those in the maintenance of way department, are not subjected to the confines of great cities. Nevertheless, in most of the smaller towns the positions occupied by railway tracks and yards are among the least attractive. Yet, as a rule, those railroads which provide section houses or other habitations for employees locate them on some unused part of the right-of-way where they are close to the tracks. And even at the outlying stations away from settled communities, the location of the section house has little to recommend it as a place of habitation that will breed contentment.

Few men are so low in the scale of humanity as to desire no more than a mere animal existence, or to be content with a house that affords nothing but a place to sleep. Therefore, a railroad cannot expect to hold real men as foremen unless the section houses are fit to be called homes. To provide a well-built and properly appointed house is not enough. It must be given a setting that will serve in the greatest measure to satisfy the craving for the beauties of nature inherent to the normal human being.

The most practical measure to this end is the planting of trees, shrubbery and vines, and the providing of a garden plot. Many railroads have recognized this basic requirement and have made considerable progress in this direction. But to a certain extent, this has taken the form of standardization measures without particular effort to enlist the co-operation or interest of the tenant. More would be gained through encouraging the foremen or other occupant of the house to exert his own efforts towards improvement of his surroundings. It is only through effort in his own behalf that a man acquires the proprietary interest that makes for real attachment to the place he calls his home. By encouraging the foremen to plant trees and shrubbery, supplying them to him or advising him of the species most adapted to his location and the care necessary to produce the best results, the railroads will evidence their interest in their employees welfare which will also add appreciably to the esprit de corps. It is said that men will fight for their homes, but this means real homes, not bunk houses.

Santa Fe Taxes Increase.—The taxes of the Atchison, Topeka & Santa Fe for 1922 will total about $16,000,000, an increase of $2,000,000 over 1921.

Letters to the Editor

STRENGTHEN THE TRACK SHOVEL

Ranger, Texas.

To the Editor:

While discussing the improvements in track tools, let us consider the track shovel. A large part of the shovels used in track work at the present time are made with the straps welded in the shank at the point where the strain is greatest, rendering the shovel so liable to breakage (most of them are broken here) as to necessitate extreme caution against the slightest misuse. The track shovel is the most constantly used tool, but danger of breakage will frequently cause a track foreman to retard his work by "calling down" a man for using a shovel for light prying, etc., when perhaps the man is conscientious in wanting to save time by it. Ten per cent heavier straps, forged solid, will increase the life of the average shovel at least 100 per cent and at the same time tend to speed up work, since foremen will not be compelled to interfere with their men as frequently to prevent breakage.

George B. McClellen,
Section Foreman, Texas & Pacific.

USING THE GAS WELD ON CHIPPED RAIL ENDS

Belen, N. M.

To the Editor:

The picture below shows the kind of chipped end rails which we are building up by the gas welding process. We have a gang consisting of one welder and a helper who have been building up battered and chipped rail ends since August 15 of last year, and up to February 1 it had built up 3,793 rail ends without losing a single joint.

In my judgment, the secret of building up rail ends successfully lies in preheating the rail to the same temperature as the metal that is being applied, in working this metal to a smooth finish while hot and in the proper cutting of the joint between the rail ends. The greatest care must be exercised in cutting. Hot cut chisels should be well drawn out and kept very sharp at all times for this purpose, as a bad cut with a dull chisel or a cut that is not exactly square with the rail ends will generally result in the chipping out of the metal applied.

Chips Like These Are Repaired in Track

The two men we have on this work are now building up an average of 36 rail ends per eight-hour day, at a cost of 80 cents per joint divided between a labor cost of 48 cents and a material charge of 32 cents. We use a common blacksmith's flatter to finish the joint on both top and sides; the only place we use the chisel is between

the rail ends. The welder, however, makes use of a machinist's hammer while he is applying the metal. The flatter is held by the welder while the helper strikes it with a No. 8 sledge hammer. This work is done while the metal is hot. We furnish the men with a light push car made from an old hand car to handle their gas tanks while welding. They are handled to and from work on a section motor car.

This work is being done on track on a helper district with a grade of 1¼ per cent on which Santa Fe type engines handle 100 car trains of 3,500 to 4,000 tons.

J. E. EMOND,
Roadmaster, Atchison, Topeka & Santa Fe.

AN EARLY DESIGN OF SNOW PLOW

Marquette, Mich.

TO THE EDITOR:

I noticed a description in the February issue, page 69, of a snow plow or widener, which is called a new type of snow plow. This company has had a plow or car of this kind in use for over 30 years. While it may be a little different it was built for the same purpose, that is, to pull the snow in from the sides of the cuts so that the rotary plow following behind can throw it out. Our plow was built on a flat car by extending the side sills about 14 ft. and adding two wings on the back end of those sills, which wings work opposite those of a snow spreader; that is, instead of shoving the snow out they pull it in. This car was built in 1891 and has been in service ever since. The wings are about 10 ft. long and, when fully open, cut seven feet from the rail. Both sides can be operated at the same time and it does the work in very good shape.

I believe there are now rotary plows with extension hoods which can be opened up to cut about five feet outside of the rails. Our rotary, however, has been in service for several years. We use this car for widening out the cuts. However, where the snow is seven or eight feet deep, it is necessary to make two and sometimes three runs through the cuts, to clear away all the snow. It works, however, on the same principle as the car described in your February issue.

H. P. SAFFORD,
Assistant General Roadmaster, Duluth, South Shore & Atlantic.

SOME DIFFERENCES OF OPINION ON THE LAYING OF RAIL

Chicago, Ill.

TO THE EDITOR:

In reading the article entitled "An Organization for Laying Rail," which was published on page 9 of the January issue of *Railway Engineering and Maintenance* I was impressed with a number of statements made therein which are not in accord with my experience and practice. Among these is the statement that some short rail should be unloaded on tangents in case one rail runs ahead of the other. This should not happen if the allowance for expansion is watched as it should be so that the net result is uniform. It is true that if the rail on one side is laid in the forenoon and on the opposite side in the afternoon, that laid in the afternoon will run ahead owing to the higher temperatures unless the expansion allowance is reduced accordingly as it should be.

Also in place of computing the relative lengths of rail on the outside and the inside of the curve to determine the lengths which should be laid on the inside, I suggest distributing a 32 ft. rail every 10 to 15 rail lengths and dropping one in place wherever it fits the condition.

The writer of the article also stated that short rails should be loaded at the mills so that they can be unloaded continuously out on the line. In other words, he expects to have the rails sorted at the mill. I have been unloading new rail from the various mills for over 30 years and I have also visited the mills where these rails are loaded, and I have yet to find a car of short lengths loaded in this way, the mills usually loading them the way they come from the straightening table.

As to the curving of rails, I maintain that it is unnecessary to curve rails for curves of six degrees or less. In fact, a much better job can be secured if the rails are not curved. On sharp curves it is advisable to tighten the bolts tight in each joint before the rail is spiked in place.

Instead of organizing a gang of 15 or 20 men under an experienced foreman and assistant to unload rails as suggested in the article, I have found that much better work can be done by employing a few section men for this purpose, as extra gang men are usually inexperienced and inefficient, especially in handling heavy materials. I make it a practice to unload angle bars as rail is unloaded, dropping one pair of bars for each rail and unloading the bolts, spikes and tie plates as the train is moving. However, these last mentioned materials, and particularly the bolts, should not be unloaded too far in advance of the rail laying gangs.

Referring to the organization of the rail laying gang, it was stated that three men were assigned to the pulling of spikes and making connections to allow for the passage of trains. I am wondering how much rail a gang will lay with this number of men pulling spikes, particularly on curves where three or four spikes may be inserted in each end of the tie. I have found that it takes about 12 men to pull spikes in order to keep ahead of the remainder of the gang.

I have found it most economical to use not less than 60 men when laying steel and when an hour or two can be secured between trains to have part of the spikes pulled, particularly all slot spikes, the ties adzed down, and other operations completed as far as practicable so as to get as much rail as possible in when the track is broken. I recommend spiking only enough behind the gang to make the track safe and build it up enough to let a train over and then drop back and finish it while other trains are passing the site of the work.

ROADMASTER.

NEW BOOKS

Proceedings of the American Railway Bridge and Building Association. 296 pages, illustrated, 6 in. by 9 in. Bound in paper and cloth. Published by the association, C. A. Lichty, secretary, C. & N. W. Ry., Chicago.

This volume contains the proceedings of the thirty-second annual convention of this association, which was held at Cincinnati on October 17-19, 1922. It includes eight reports and two papers which maintain the high standards for technical work long held by this association. Among the reports of special interest and value in this volume are those on labor-saving devices in routine bridge and building work; pile driving and pile driving records; the relative merits of wood, steel and concrete tanks, and the framing of bridge timbers before treatment. Of special merit were an address on the fundamentals of organization by R. N. Begien, general manager, western lines, Baltimore & Ohio, and a paper on the reconstruction of the Southern Railway bridge at Cincinnati by F. W. Henrici, assistant engineer of construction of the American Bridge Company. The book also contains the constitution of the organization and a complete list of the members, together with their addresses and connections.

Handling Concrete With Motor Cars

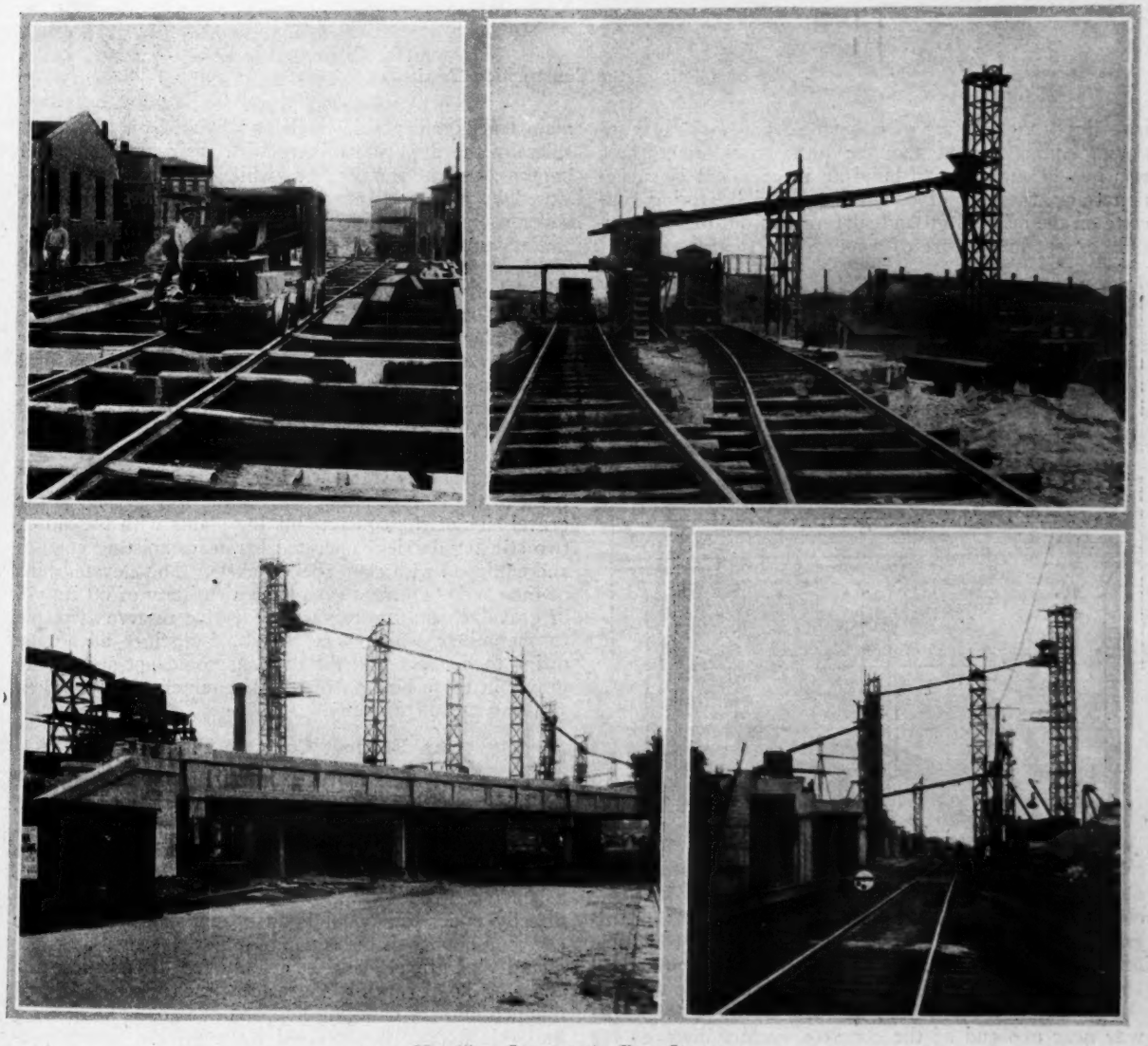
Large Capacity Plant Developed by the Burlington for Track Elevation Work at Aurora

THE use of gasoline operated section cars to handle concrete hoppers mounted on push cars comprises one of the novel features of an effective plant developed by the Chicago, Burlington & Quincy at Aurora, Ill., to mix and place some 12,000 cu. yd. of concrete in connection with track elevation work in that city. Another noteworthy feature is provision for duplicate mixing equipment, two one-cu. yd. mixers being provided complete with towers and spouting so that the breakdown of either one would not tie up the work after the mixing of a run had started.

The conditions imposed by the layout at Aurora are similar to those encountered in most railway grade separation projects in American cities in that the structures in which the concrete was to be placed were distributed over a considerable distance, so that delivery from a single fixed concrete plant by means of towers and spouting was out of the question, but a further complication was introduced at Aurora by virtue of the fact that a portable mixing plant mounted on railway cars of the type which has been developed by a number of western railroads could not be used. It was this condition which led to the development of the delivery system mentioned above and which not only proved entirely practical but was also found highly efficient and reliable.

A Long Concrete Viaduct

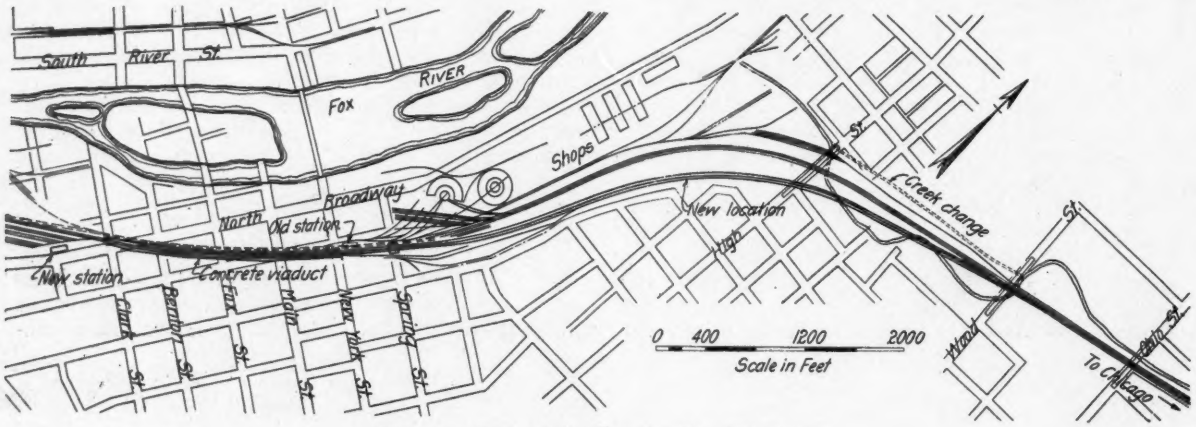
For a distance of almost one-half mile and at about the mid length of the track elevation territory the tracks will be carried on what will be almost a continuous con-



Handling Concrete in Two Stages

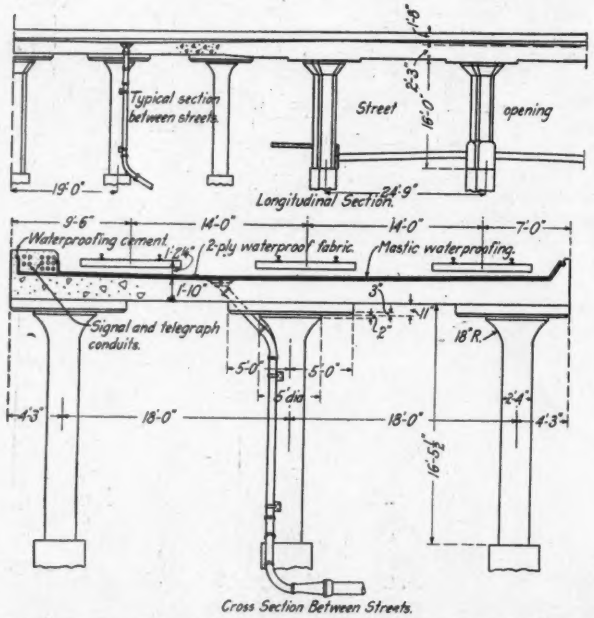
Running the hopper car over the forms. Concrete was delivered by spouts to the loading stations. Some of the concrete subways are on a sharp skew. The temporary main tracks.

crete structure comprising a length of 500 ft. in several concrete subways spanning city streets in close proximity, and 1,420 ft. of a reinforced concrete viaduct of flat slab construction. This track support is being made wide enough for three tracks and leaves barely sufficient space along one side of the right-of-way for two temporary main tracks on approximately the natural ground surface. The traffic on these two main tracks quantity of concrete required, but introduced an interesting problem in delivery which was solved in a novel manner. The land acquired was occupied by a number of buildings, some of which were torn down, but a considerable number were retained for such use as could be made of them in connection with the plant. As shown on the plan the mixing plant is arranged in the form of a quadrangle, open on the one side toward the two



Map of a Part of the Construction Territory

is so heavy that the use of either of these tracks by concreting equipment is out of the question and since there was insufficient space to build an independent construction track, the idea of concreting or of delivering concrete on the original ground surface was out of the question, except in the case of some of the footings and the



Details of the Reinforced Concrete Trestle Construction

columns of the flat slab structure. The use of standard-gage equipment on the track overhead was not feasible because the continuous flat slab construction precluded the building of falsework of sufficient strength to carry it.

Fortunately the purchase of some additional right-of-way near one end of the concrete viaduct involved the acquisition of more land than was required for railway purposes and this afforded space for the erecting of a concrete plant of adequate size to handle the large main tracks and a side track and flanked on two other sides by the duplicate mixers with their towers, gravel hoppers, cement storage, etc., while the rear side is enclosed by a row of miscellaneous buildings used for a boiler room, blacksmith's shop and other purposes.

The aggregate for the concrete was a bank run gravel obtained from the railroad company's pits at Sheridan, Ill. This gravel was received and stored in the central area enclosed by the buildings, mixer plants, etc., mentioned above. The fact that the temporary tracks are at an elevation of from seven to ten ft. above the natural ground surface at this point was of considerable advantage in increasing the storage capacity of the area, and from 1,500 to 2,000 cu. yd. of gravel have been accommodated readily in the storage pile.

The gravel was transferred from cars on the material track to the storage pile and from the storage pile to the gravel bins of the concrete mixing plants with the aid of two stiff-leg derricks operated by steam hoisting engines and equipped with clam shell buckets. The elevated bins of the concrete mixers each have a capacity of 60 cu. yd. of gravel, thus affording a considerable reserve available to the mixer which was found of distinct advantage owing to the fact that the derricks could not supply the gravel in these bins as fast as the mixers used it when working at full capacity.

An Efficient Concrete Plant

The mixers are each completely enclosed in a house, the predominating feature of which is the charging room, having its floor directly over the top of the mixer. This room is afforded convenient access to the cement storage while the gravel from the aggregate bin feeds through a spout controlled by a gate in one wall. In the floor directly under this spout is an opening located over the charging hopper of the concrete mixer so that the proper quantity of gravel could be readily fed directly into the charging hopper, while the cement was wheeled in and dumped into the charging hopper by hand. The opening into this hopper is protected by a grizzly, which prevents large stones from getting into the mixer.

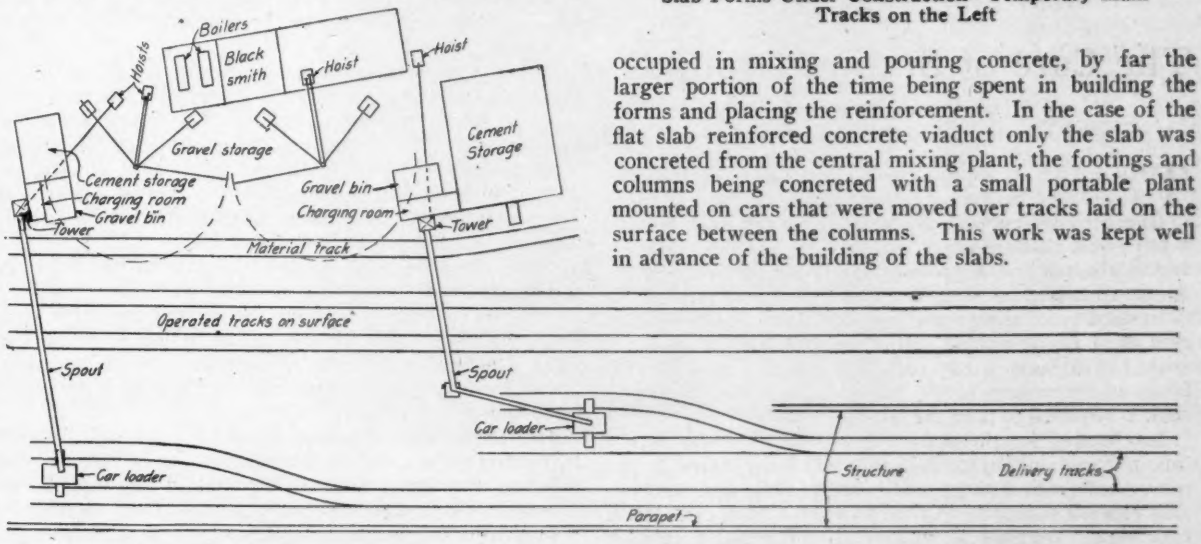
The mixers are steam operated Smith mixers of one cubic yard capacity and discharge into elevating buckets.

The entire plant is operated by steam. In addition to the engines used to operate the mixers there are separate units for the various hoisting operations. These include a hoisting engine for each of the two stiff leg derricks and one each for the two concrete towers. Steam for these various units in addition to that for two water pumps is provided by two locomotive type boilers.

The Delivery System

Owing to the long distance over which the concrete had to be transported, a maximum of 1,600 ft., delivery with towers and spouting was out of the question. Consequently the plan was adopted of delivering the concrete over the top of the new structure on light falsework supporting tracks that would readily carry light equipment. However, this plan was complicated by the fact that the new structure lies on one side of the temporary main tracks while the concrete mixing plant is on the other side. This, therefore, required the provision of towers and spouts in order to deliver the concrete from the mixing plant to the cars on the new structure. These towers are of wood, but the spouts, bucket, etc., are standard Insley and Lakewood equipment.

The delivery system is also entirely in duplicate, the tower and spouts from each concrete mixer delivering to separate station or receiving hopper for loading the hopper cars. Each station was provided with an independent system of tracks, as shown on the plan, each system serving one longitudinal half of the concrete structure. Each system of tracks consists of a single track extending out over the concrete viaduct and dividing into two tracks which pass on either side of the loading station.



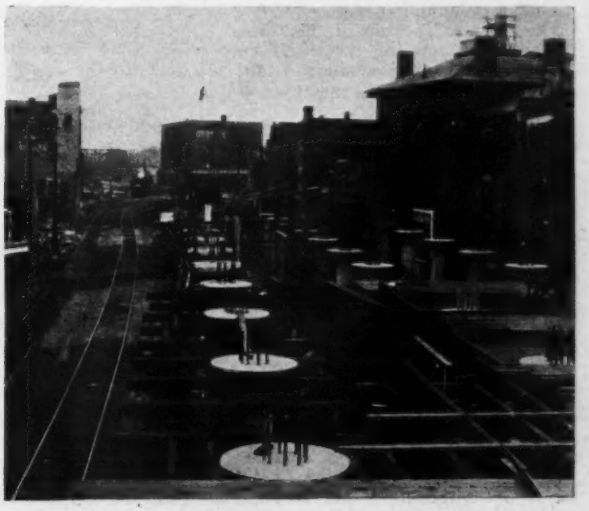
The Concrete Plant Was Separated From the Viaduct by the Operating Tracks

This consists simply of an elevated wooden box with a spout and gate on each side.

When the concrete was being placed within 700 or 800 ft. of the mixing plant it was readily delivered by two trains of cars on each track, one train being unloaded while the other was being recharged, the two trains avoiding each other by using alternate tracks at the charging station. As the length of the haul increased it became necessary to add another train to each system and in order that the trains could stay out of each other's way it was necessary to provide each with a passing track about half way of the length of the viaduct. This train consisted of a Fairmont six horse-power section motor car with a concrete hopper of one cubic yard capacity mounted on a push car. Some of these hoppers were of wood with side dump gates and the others of steel with bottom dump gates.

The Organization

As in the case of practically all railway concrete construction it was necessary to plan the organization for carrying on the work with the imposed condition that only a relatively small portion of the time would be occupied in mixing and pouring concrete, by far the larger portion of the time being spent in building the forms and placing the reinforcement. In the case of the flat slab reinforced concrete viaduct only the slab was concreted from the central mixing plant, the footings and columns being concreted with a small portable plant mounted on cars that were moved over tracks laid on the surface between the columns. This work was kept well in advance of the building of the slabs.



A View of the Trestle With the Columns Concreted and the Slab Forms Under Construction—Temporary Main Tracks on the Left

Beside building the forms considerable work was involved in the bending and placing of the reinforcement for the flat slabs. Bars of ½, 5/8, ¾ and 7/8 in. size were used in lengths varying from 10 to 52 ft. The bars were unloaded on the elevated ground at the south end of the flat slab structure where they were bent, loaded onto push cars and hauled out to the places for inserting them in the forms. The total weight of bars used was approximately 500,000 lb.

The slabs were poured in units 210 ft. long containing approximately 800 cu. yd. of concrete. This required two or three days' concreting with an average output of the two mixers, including breakdowns, delays, of 41 cu.

yd. per hour. The maximum rate in some cases was as high as 45 cu. yd. per hour. In most cases from two to three weeks were required to prepare the formwork for one of these concreting sections; therefore, the gang employed in doing the concreting was engaged on the formwork in the intervals between pourings.

The crew for one mixer consisted of the following organization:

One mixer man and water tender
One man at the gates
One man cutting bags
One man dumping bags
One man at the top of the tower
One man operating the tower hoist
Four men loading cement
Four men wheeling cement.

One of the stiff leg derricks was equipped with a modern bucket and the entire operation was conducted by one man at the hoisting engine. One fireman tended the boilers and the pumps. The crew on the deck included two car loaders at the loading dock and from four to six men operating the motor cars, two switch tenders at the loading dock and (when the passing tracks were used) two additional switch tenders for the passing tracks. Six to eight men were engaged in dumping cars and handling concrete in the forms. One sub-foreman looked after the placing of the concrete.

This concrete plant was developed by the bridge department of the Chicago, Burlington & Quincy under the general direction of G. A. Haggander, bridge engineer. The operation in the field was under the general direction of R. E. Sheehan, supervisor of bridges, and under the immediate supervision of William McDonald, general foreman, and William Ascott, foreman.

The Care of Station Grounds*

By W. D. Newell
Section Foreman, Kansas City Southern, Fisher, La.

THE CARE of station grounds warrants careful consideration, because it is here that many people meet to transact business with the railway. If the premises are kept in neat condition they will draw favorable comment, and at the same time promote sanitation and reduce the danger of fire.

In most cases the grounds around stations can be kept neat and clean at a small cost if this is done in connection with switch lamp work, for most sections have switch lamps in the vicinity of the station, and the entire gang is seldom required to tend the lamps.

In cleaning up the station grounds, all waste paper, bits of food, and any rubbish that will burn should be removed to a safe distance and burned, while non-combustible rubbish should be trucked away on a push car. Much care should be used to remove all inflammable rubbish from the small openings between the platform sills and the station building to eliminate the danger of fire in this opening.

Where a station is built on low, flat ground, and water stands under the building, ditches or drain pipe should be installed to drain it off, as this makes an ideal place for mosquitoes to breed. Weeds and grass should not be allowed to grow on the platform, but grass may be allowed to grow on other parts of the premises if kept cut close to the ground.

Water barrels should be kept filled and placed in convenient places for use in case of fire. A small amount of kerosene oil can be poured on top of the water to prevent mosquitoes breeding in the barrels. Fire buckets should be kept fastened to the barrels or their covers.

Company material should never be stored on a station platform, except while awaiting immediate shipment, and in such cases it should be neatly stacked at a safe distance from tracks and walkways. Material stored elsewhere should be piled neatly and not nearer than 12 ft. from the nearest rail.

When working on tracks around stations, all tools and material should be placed where passengers and employees will not fall over them, and work should be kept finished as fast as possible. In no case should work be left unfinished over night.

Station platforms and other grounds used by passengers and employees should be kept free from snow and ice. Toilets should be kept in a clean and sanitary condition by the section men, if no help is furnished the station agent to do this work. Grass on walkways to toilets should be cut and all holes filled in.

Tracks around a station should be kept in the best possible condition, grass and weeds cut, bad ties removed, spikes driven tight against the rails, bolts tight and track well dressed. Passengers often walk about the tracks near the station while waiting for trains, and they are quick to notice small defects.

If station platforms were so constructed that water would drain away from the tracks, instead of towards them, the maintenance of dirt, gravel or shell platforms would be easier. With the common method of drainage, the track is kept soft, and it is necessary to disturb portions of the platform frequently, causing soft places near the track.

Foremen should ask station agents to assist in preventing vehicles from being driven on the platform, for if this is allowed it will soon ruin the platform. It is also a dangerous practice.

The grounds around a section house should be given much the same care as station grounds. Much can be done to beautify these grounds. The fence enclosing these premises should be kept in good shape by nailing loose boards to posts, stretching wire, and painting or whitewashing. Trees and shrubbery can be planted in neat order, which will make the grounds look beautiful, and give much comfort in hot weather.

Trees should not be planted too close to buildings, as too much shade will cause the roof and other parts to decay. Shrubbery should not be planted too thick, and cause too much shade for mosquitoes to hide in during the day. Neither should trees or shrubbery be planted near a well, as insects will fall into the well and spoil the water for domestic uses.

If grounds around section houses are not well drained by naturel slope, small surface ditches can be dug without injuring the appearance. Dirt should be thrown up around the well to prevent surface water from entering it.

Screens on the houses should be kept in first-class shape. Many diseases can be prevented by proper screening and cleanliness around the premises. Water barrels should be kept filled for fire use, with oil on the water, as mentioned for station barrels.

The toilets for the buildings should be kept in a neat, sanitary condition. Seat covers should be kept closed to prevent flies from entering the pit underneath the seat. Earth thrown up around the toilet will prevent the pit from filling with water.

Last, but not least, the tool house can be made to look better by keeping material, tools and scrap neatly arranged. Care should be used to prevent fires starting from oil kept in tool house. If gasoline is stored in a tool house, a sign should be placed on the outside of the building to that effect.

*Abstracted from a paper presented before the Kansas City Southern Maintenance of Way Association at Shreveport, La., on Feb. 10.

Do You Ever Develop Your Thoughts by Putting Them on Paper?

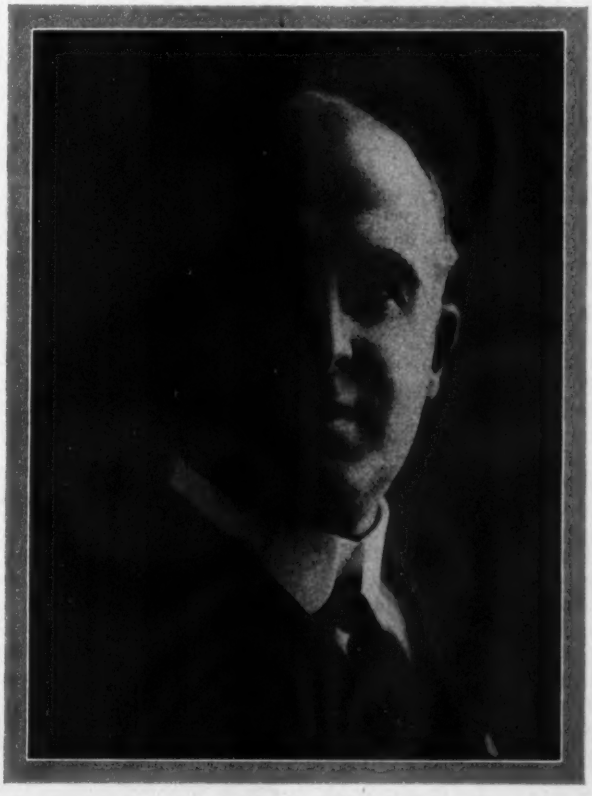
Mr. Begien Says That It Will Help You to Clarify Your Ideas and Analyze Your Problems

By WALTER S. LACHER

IS TECHNICAL training of value to the operating officer? This question is answered in the methods pursued by R. N. Begien, general manager of the Baltimore & Ohio, Western Lines, for, as one officer of that road has expressed it, "Mr. Begien is constantly applying analytical methods to operating problems. He didn't drop his technical knowledge as soon as he got out of the engineering department. In fact, he gained his knowledge of railroad operation through observation and experience just as he did his engineering, and he realized that both are susceptible to the same methods of study and analysis."

Mr. Begien attended Harvard for two years but as would be inferred from the above, he did not study engineering, for though he took a considerable interest in mathematics, he specialized in languages. Engineering as a vocation was, at that time, far from his mind. He did, however, possess a natural adaptability and had acquired a certain degree of skill as a draftsman, and this undoubtedly had its influence on his subsequent career.

His entrance into engineering work was purely by accident. After discontinuing his studies at Harvard, he set out to find work. An engineering corps was being organized for the Nicaraguan Canal survey. The climatic conditions of Nicaragua, a country with an average rainfall of 300 inches, were not attractive, and as it was hard to find men who were willing to go down there, he managed to get a job. The work consisted of topographic surveys and considerable hydrographic work on Lake Nicaragua. Some two years later, in 1900, he went to Ecuador as assistant engineer on preliminary surveys and location on the Guayaquil & Quito Railroad.



R. N. Begien

General Manager, Baltimore & Ohio, Western Lines.

Mr. Begien was asked if he considered skill at drawing to be of any particular advantage to the engineer.

"Yes, I do. A man who can conceive a design and prepare a drawing that will express his ideas clearly to those who must give their approval, has a considerable advantage. He also has the best of it when it comes to the execution of the work. He will have a better grasp of what he is to do. You often hear of men who get things built before the plans were drawn. That has been done, of course, but it is not the way to get things done right. The structures built that way may be strong enough, but you cannot always be sure of it, and it is pretty certain that they will not be economical."

"But isn't a good draftsman at a disadvantage, sometimes, because of his ability at drawing, in that his superiors are inclined to keep him at it instead of giving him an opportunity to get adequate training in construction or other work designed to develop executive ability?"

"An engineer should realize that drawing is a means to an end and a young engineer with ability as a draftsman should not allow himself to become a draftsman pure and simple. In Nicaragua I encountered just what you mention and on going to Ecuador, a definite stipulation in my contract relieved me from employment as a draftsman and enabled me on two occasions to decline to go to the office as chief draftsman. On the other hand, the ability to make drawings and also to read them quickly is a great help in any position."

In 1901, Mr. Begien returned to the United States to take a position as assistant engineer in the engineering department of the District of Columbia, where he was engaged in subdivisional work and a large amount of computing. But this work was not to his liking. To put it in his own words, "I never cared about a job that started at nine in the morning and quit at four."

It was with no reluctance, therefore, that he gave up his work at Washington to enter the employ of the Baltimore & Ohio as assistant engineer under Francis Lee Stuart, his old chief at Nicaragua, who in the meantime had been made engineer of surveys of the Baltimore & Ohio to undertake the study and location of various new lines including a low grade line from the Fairmont coal fields of West Virginia to tidewater.

It is clear that during the next four years Assistant Engineer Begien applied himself whole heartedly with the result that he established some remarkable records, particularly for rapid surveys. This was accomplished through an ingenious use of the available United States Geological Survey maps, a finished skill in reconnoissance and an enormous amount of night work in plotting the notes of the day and preparing paper locations, and in planning the work of the morrow, but it involved above all the exercise of a high quality of leadership in the personal direction of the field parties. Running races with the men to and from work morning and evening were among the devices applied to this end, but even more effective was a spirited participating in the work itself. It is said of Mr. Begien that he could always excel any other man in the party in the performance of any detail of the work and that he often availed himself of this ability in the "spelling" of some transitman, leveler or topographer at intervals during the day.

"You told me that you had had no interest in engineering work and that your start in railroad work came as a mere chance. At what point in your career did you conceive any definite plan as to the branch of the service you wished to follow?"

"A man on location is separated from the railroad. In fact, there are times when he is required to keep what connection he has 'under his hat.' This isolation makes it difficult for him to formulate any definite ideas concerning a railway career. I know that I did not develop any until after I got into other work. On the conclusion of the surveys I was transferred to the chief engineer's office on special assignments. For a time I served as division engineer and acting engineer maintenance of way; later I became assistant to the chief engineer, Mr. A. W. Thompson, and when he was promoted in succession to general manager and third vice-president, I continued as his assistant on special assignments, including such matters as tonnage ratings; but I finally concluded that I wasn't getting anywhere and wouldn't until I got into a line position. Consequently, I made every effort to be transferred and finally, in December, 1912, I was appointed assistant general superintendent at Baltimore. The following April I became general superintendent of the Baltimore & Ohio Southwestern at Cincinnati. That was just after the disastrous floods of 1913 and for the next year I was concerned primarily in the reconstruction of the damaged lines."

Mr. Begien's brief reference to his special work as an assistant to Mr. Thompson points to a phase of railway transportation in which the services of the analyst have proven exceedingly valuable. During this period he conducted extended studies of train resistance over a large part of the Baltimore & Ohio system with the aid of a dynamometer car and on the basis of data thus obtained he was enabled to present plans for improvements in tonnage ratings that exerted an important influence on the large increase in the average train load effected by the Baltimore & Ohio in recent years. In this connection he also had an active part in the work of the American Railway Engineering Association's committee on Economics of Railway Location.

Mr. Begien became chief engineer of the Baltimore & Ohio system in July, 1916, and in the following May was made general manager of the Eastern lines. During Federal control he was operating assistant to the federal manager of the Eastern lines until January, 1919, when he was made federal manager of the Western lines. After the termination of Federal control he became general manager of the Western lines.

Mr. Begien is a firm believer in a definite line of authority whereby each man is afforded a maximum scope of responsibility and the greatest opportunity for the exercise of initiative. In general, he believes in leaving the details to others, but when occasion demands he can quickly take up detail matters in any phase of railway transportation in a way that manifests a thorough mastery of it. His aptness at figures is most frequently brought into play; he will often carry out calculations himself rather than to wait for someone else to do it.

His ideas on organization have been disclosed in a paper on Fundamentals of Organization presented before the American Railway Bridge and Building Association at its last convention in Cincinnati. This paper was not only received with enthusiasm by those who attended the meetting, but has since gained wide attention from railway officers. A conversation with Mr. Begien regarding this paper disclosed the fact that it represented a development of 11 years, the first draft having been prepared in 1912, shortly after he had been appointed assistant general superintendent.

"I have always found it a good plan to put my ideas on paper," he explained. "It helps me to get them well in hand, to put them into logical order and to eliminate errors. It also puts them in a form that can be more readily transmitted to others. In this case, I had given considerable thought to the matter of organization, as I wanted to have something I could send out to the superintendents as representing my ideas."

In matters concerning personnel, he applies this faculty for analysis with the same facility and every officer under his jurisdiction knows that he is constantly being measured as to his qualifications not only for his present position, but for the one above him. It is a saying with Mr. Begien that no man is ready for advancement until he is able to handle his present position well and has a working familiarity with the duties of the next position.

Keeping Bridges Clear of Drift

TO PREVENT corn stalks and similar debris carried by swollen streams from lodging against trestles, blocking the waterway and creating a fire hazard, the Nashville, Chattanooga & St. Louis has built barricades

The Drift Collects Around the Rails

of scrap rail, similar to the drift catchers which it has installed for many years at the upper ends of culverts. As described in a recent issue of the N. C. & St. L. News Bulletin, these barricades consist of a row of scrap rails set in the ground opposite the trestle bents and about 25 ft. upstream from the center line of the track. In this position the rails occupy the location of an ordinary barbed wire fence, but unlike a fence the rails not only catch the drift but make it possible to burn the debris where it is deposited. That the rails form an effective barricade is indicated by the illustration.

Building a Fill Without a Trestle

Use of a Derrick Car to Throw Tracks Greatly Expedites the Construction of Embankment

By C. K. Conard

Formerly Constructing Quartermaster, Construction Division, United States Army

IN MAKING low fills, where the question lies between building a trestle and jacking the track up, or where it is imperative to raise without using a trestle, as in many grade crossing eliminations, the following method may be found profitable. It was used in the construction of single track fills across salt meadows at Raritan Arsenal, Metuchen, N. J., during the late war. The results were so satisfactory that in the opinion of the writer the principles could be adapted elsewhere. A brief description of the conditions leading to its use may serve to illustrate how similar conditions may be overcome.

A Derrick Car With a Bridle Bar and Clamps Was Used to Throw the Track

At Raritan Arsenal about fifteen miles of track were to be placed across salt meadows that varied in depth from 5 to 30 ft. The surface of the meadow was covered by a mat of vegetation that was sufficiently stable to support a track carrying a light locomotive that was used for delivering cars of material. The ties would sink under the loads, and it was necessary to unload the cars immediately or they would capsize. But practically all of the track material was forwarded to the front and assembled without any serious accident.

Soundings Were Taken

Soundings had been taken over the entire area, the hard bottom being quite distinct from the soft material of the meadow. The sounding rod that passed easily through the upper material would fetch up as suddenly as though a sandy bottom lake were being sounded. The contours plotted from these soundings had an appearance quite similar to the adjacent country above sea level. The elevation of the grass surface was approximately that of mean high tide.

In determining the amount of material that had been placed in an old railway fill leading from clay pits to a dock on the Raritan river, auger borings were made through the embankment. At the bottom of the fill the auger would pass from the sandy material wasted from the strippings of the clay banks into the original sod and clayey material of the meadow. The depth could be determined with great accuracy, in fact practically to the tenth of a foot.

The auger borings were continued down to hard bottom. From a study of the plotted cross sections it developed that almost invariably the surface of the meadow was depressed to one-half the original depth. This, of course, meant that the weight of the fill squeezed the water out of the clayey material and roots of the vegetation. The compressed material remaining was blue clay similar to that in the clay banks. These facts were borne out when an excavation was made through the embankment for the purpose of installing a tide gate. The line of the original surface, as depressed, was clearly indicated by the streak of decomposed vegetable matter just below the fill material. It would seem that the continued softness of these meadows is partly due to the water contained in, and induced by, the vegetable growth. It was considered remarkable that the borings indicated that there had been no upheavel of the meadows. This was due, in all probability, to the strength of the mat of vegetation. With one exception we had no trouble from the pushing out of material and upheavel. On the dyke construction parallel to the Raritan river, the mat broke with vertical fissures, and the meadow not covered by the fill rose five or six feet, or practically to the elevation of the top of the dyke.

Ordinary Methods Too Expensive

The problem was to construct fills less than four feet in height for the single tracks needed to serve storage buildings scattered over the meadow. At first the usual custom for soft ground was followed. Rough timbers were placed under the ties in order to provide a bearing for the jacks used in raising the track. This was too slow and expensive to be continued and after study of the matter it was determined to use machinery for lifting the track.

It was realized that the machines would have to be comparatively light. The best suggestion was for a derrick with a 40-ft. boom, erected on one end of a flat-car, and operated by a hoisting engine located at the other end. Two clamps, connected by a bridle bar, engaged the rails. While actually at work, motive power was furnished by hooking a cable to the track, some two hundred feet to the rear, and hauling in over a "nigger head" on the hoisting engine.

The material for the work was largely obtained from old spoil banks near the clay pits in the hill section of the arsenal property. A large proportion of the material was sand. The working face averaged over 20 ft. high, and the runs were usually over 500 ft. The haul averaged over two miles.

The equipment consisted of two 60-ton, 2½ cu. yd. dipper, steam shovels and 72 side-dump cars, of capacities from 12 to 16 cu. yd. Many of these cars had previously

been used in the construction of the Panama canal. Five to six standard gage locomotives were employed, the usual train consisting of 12 cars.

How the Work Was Done

In operation the derrick car would be pushed by the work train to the far end of the track to be raised, with the boom facing away from the train. After dumping material alongside the track the train would pull out. The derrick car would then "crab" back until the rail clamps were opposite the material dumped by the end car. The track would then be raised about 18 in. and dirt shoveled under and between the ties, care being taken to provide a good bed for the track to settle on. By successive moves of half a rail length, the material dumped by one train could be handled before another train arrived. The usual permanent raise of one operation was close to one foot. A foreman and 25 men were able to keep up with the work trains dumping material. Each steam shovel with three trains furnished material for one gang.

It may be asked why track throwing and spreaders were not tried. The answer is that the fills were for single track and, moreover, before a height of three feet could be obtained the settlement into the meadow began, and from that time until final settlement, every raise made during the day would be lost by the following morning. At one place, close to the Raritan river, previously mentioned, the soft meadow material was pushed out and the fill extended practically to hard bottom. Borings showed that the new material was 34 ft. in depth. The embankment during this period was never over 6 ft. in height. Day after day the filling went on at this point, and each morning the gain made during the previous day would have to be repeated. Fortunately there was no overturning effect, or sliding to one side, and the track usually remained level transversely, but the first train out in the morning proceeded with the utmost care.

In an attempt to lighten the shoveling work a plow arrangement was designed and constructed. This consisted of two wings 24 in. deep, each set at an angle of about 50 deg. from the center line of track. An opening 18 in. in width was left between the wings at the apex. The outer ends extended four feet outside the rails. Connection to the end of the car under the derrick boom was made in such a way as to allow the whole plow to be lifted. This was necessary in order to pass low switch stands, and for transportation in a train. Cross bracing prevented side movement, otherwise when engaging earth on one side of the track the plow would have been pulled to that side.

Cars Dumped to Right and Left

In operating this machine the dirt train dumped cars alternately right and left. The derrick car would then pull itself back into position for lifting track, as before, but with the wings of the plow riding on the rails, throwing the material in towards the center. Any excess material would pass through the opening between the wings. The distance from the car wheels to the wings was the critical point. It had to be made as small as possible to avoid interference of the plow with the track lifting, but if too small would throw material under the wheels of the car. The size of dump car used, by reason of the varying size of pile of material alongside the track, governs this adjustment.

This accessory proved economical while sand was being excavated. Unfortunately we ran out of good sand shortly after adopting it. The balance of the material excavated contained some clay, and the plow had to be abandoned as the clay could not be handled. Wherever sand can be obtained for raising track under similar conditions a plow should be used.

The lifting mechanism was powerful enough to raise the track, even at the frog of a switch, when the ties were covered to the top of rail with sand. Occasionally, when frozen in, or where the ties had become embedded in clay, both clamps would be fastened to one rail, in order to raise one side at a time, but this was not the usual procedure.

The cost of the work was largely increased by the many short spur tracks serving buildings, as well as by the necessity for keeping all tracks in condition for traffic. The material for 100 storage buildings was delivered during the grading period, besides a considerable quantity of supplies stored in the buildings.

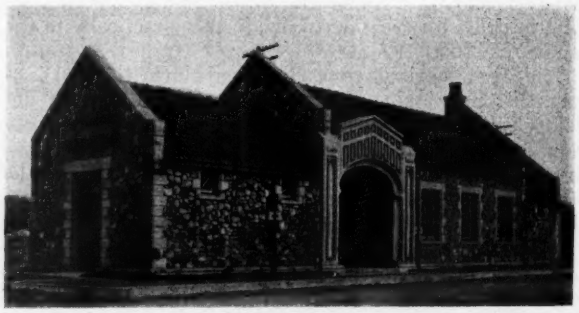
A careful cost accounting system showed that after the use of these machines was started the labor cost was reduced from over 50 cents per cubic yard excavated and placed in fills, to 33 cents. The cost for the 585,000 cu. yd. so placed being at an average of 37 cents. This cost includes loading by steam shovel at 8 cents per cubic yard, an average haul of 2½ miles at 7.4 cents, and placing in fills, including cost of keeping tracks in running order, at an average of 25 cents per cu. yd. On the dyke that was built around the entire meadow area, and where switches did not interfere, the cost of placing in the fill was 17 cents.

Measurements were computed from car records, but the average per car was checked several times during the work by measurements of cuts, and the figures are reliable. The costs given are for labor only, but all items, such as the erection of three derrick cars, are included.

Obtained Good Surface

It is of interest to note that after it was found possible to obtain a fairly smooth track when raised with the machine, the same method was used on older tracks that needed resurfacing. On these locomotive cranes were employed, cinders being used for ballast. The results were remarkably satisfactory, as the work could be done at three or four times the speed of the usual method with jacks. And, finally, no case of injury due to surface bending of rails was reported.

The writer would not, for a moment, try to give the impression that these methods should be used in obtaining final line and grade for a high speed track. That is a result only to be obtained under the careful eye of an experienced foreman, using the tools to which he is accustomed. But too often this care and expense is given to the preliminary stages of ballasting work, and the first train leaves its impression all along the line. Machinery should be used in the early stages of this work. The increasing costs of trestles make it probable that methods similar to those described will become more common in the near future.



The Lake Hopatcong Station on the Lackawanna

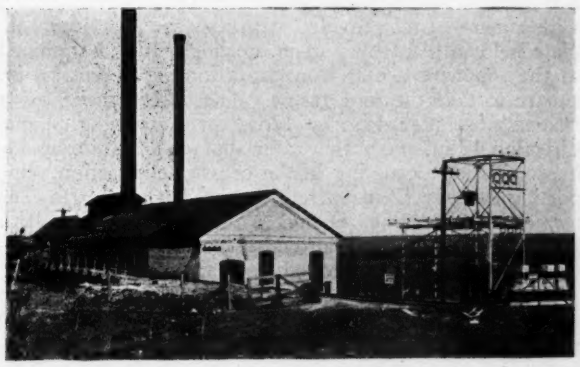
Union Pacific Enlarges Water Plant for Pocatello Terminals

Project Includes New Reservoir, Four Miles of Pipe Line and Modern Electric Pumping Equipment

A WATER SUPPLY project involving several unusual features is being carried out on the Union Pacific at Pocatello, Ida., as a means of affording a larger supply and affording increased security of service. While the work now nearing completion is in large measure a duplication of the previous installation, it embodies a number of features of unusual interest.

The water supply for the engine terminal at Pocatello, where the present normal consumption is about 1½ million gallons per day, is obtained from Batise Springs, a ground supply of the type indicated by the name, located about one-half mile from the main line at a point about four miles north of the terminal. The spring has a discharge of 15 to 20 sec. ft., of which the railroad has filings with the United States Government covering 6 sec. ft., or approximately 2,700 gal. per minute.

This water supply was developed by the Union Pacific a number of years ago with a pumping station at the spring capable of delivering 1,200 gal. per minute to



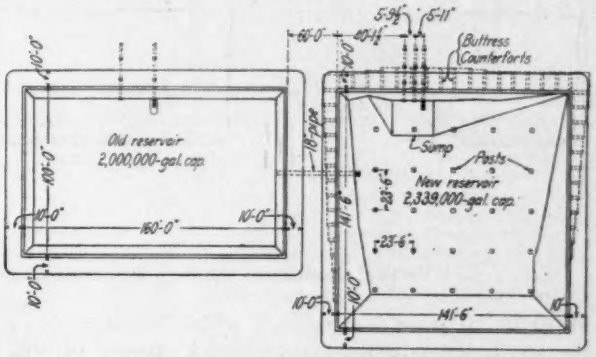
General View of the Pumping Station Showing the High Tension Transformers

Pocatello through a 10-in. pipe line. As storage to the amount of only 60,000 gal. was provided in a water tank at the terminal, provision was made for a storage reservoir of 2,000,000 gal. capacity on a hill to the south of the tracks about a mile from the spring, the elevation being sufficient to afford gravity discharge to the terminal with a delivery pressure of about 125 lb. per sq. in. This reservoir was connected into the pipe line by a branch pipe about 1,600 ft. long. The reservoir is a concrete basin of rectangular shape 160 ft. long. by 100 ft. wide, built into the rock formation of the hill.

The old pumping plant was operated by steam. It consists of two Laidlow-Dunn-Gordon double-acting, outside-packed plunger pumps, operated by direct connected cross compound condensing engines. The stroke is 18 in. with a 7¾-in. water plunger and 14-in. and 26-in. steam cylinders. Steam is supplied by two 150-hp. and two 75-hp. Babcock and Wilcox water tube boilers with hand-fired furnaces.

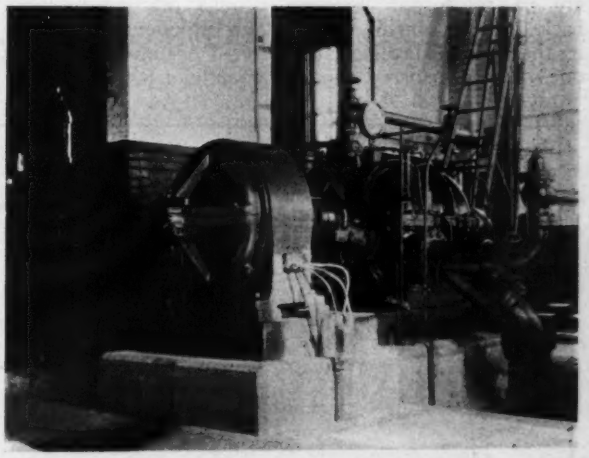
The weakness in this layout lay in the fact that the storage adequate for a day's supply of water was separated from the point of consumption by 3½ miles of a single line of pipe. Another shortcoming was the fact that while the pumping units were provided in duplicate, one of them working alone could not supply the amount of water consumed daily. Also the emptying of the reservoir for purposes of repair left the railroad without adequate storage.

To correct this deficiency it was decided to duplicate the pumping equipment, the pipe line and the reservoir. A new 12-in. pipe line was constructed from the pump house



The New Reservoir Is Located Adjacent to the Old One

to the reservoir and thence to the terminal so as to be independent of the old line save for a few cross connections controlled by valves. The reservoir was supplemented by a new one of 2¼ million gallons capacity, built



The New Electric Pump Unit

alongside the old one and the pumping equipment was augmented by a new electrically-operated pump affording greater capacity than the existing plant.

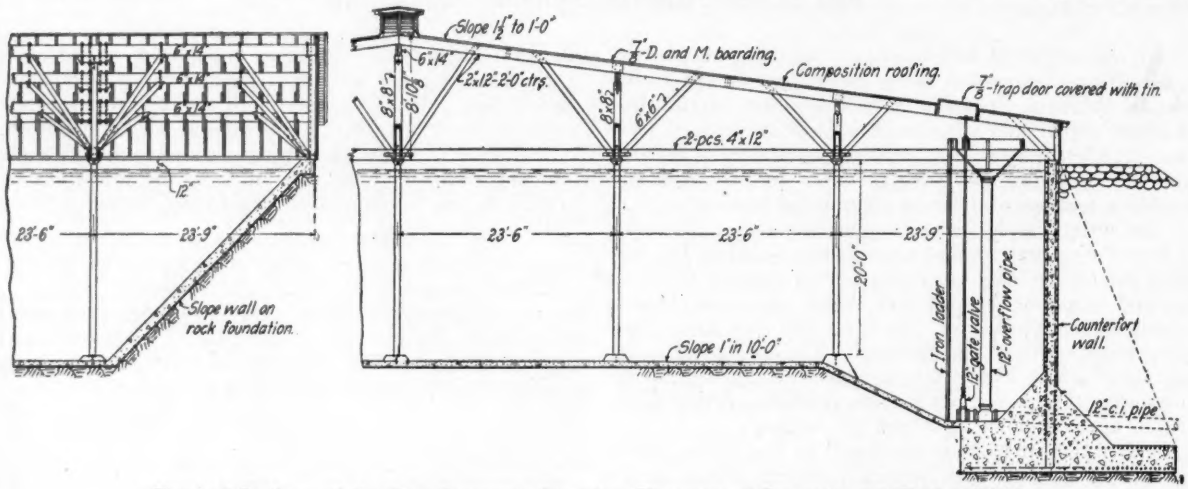
The new pump is a Worthington three-stage centrifugal pump designed to deliver 1,750 gal. per min. against a 380-ft. head, or 1,300 gal. per min. under a 475-ft. head. This pump is direct connected to a Westinghouse induction motor operated at 1,800 r. p. m. with 2,200-volt, three-phase, alternating current. This current is delivered to the plant by a local public utility at 11,000 volts, being stepped down to 2,200 volts through transformers in-

stalled at the pump house. A small electrically-operated vacuum pump is provided to prime the centrifugal pump. The pump is controlled by a push button start and stop system providing for three alternate controls, namely, push button start and stop; push button start, reservoir float stop; reservoir float, start and stop. With the new equipment installed the operation is normally electrical. The steam plant is held in reserve for emergencies.

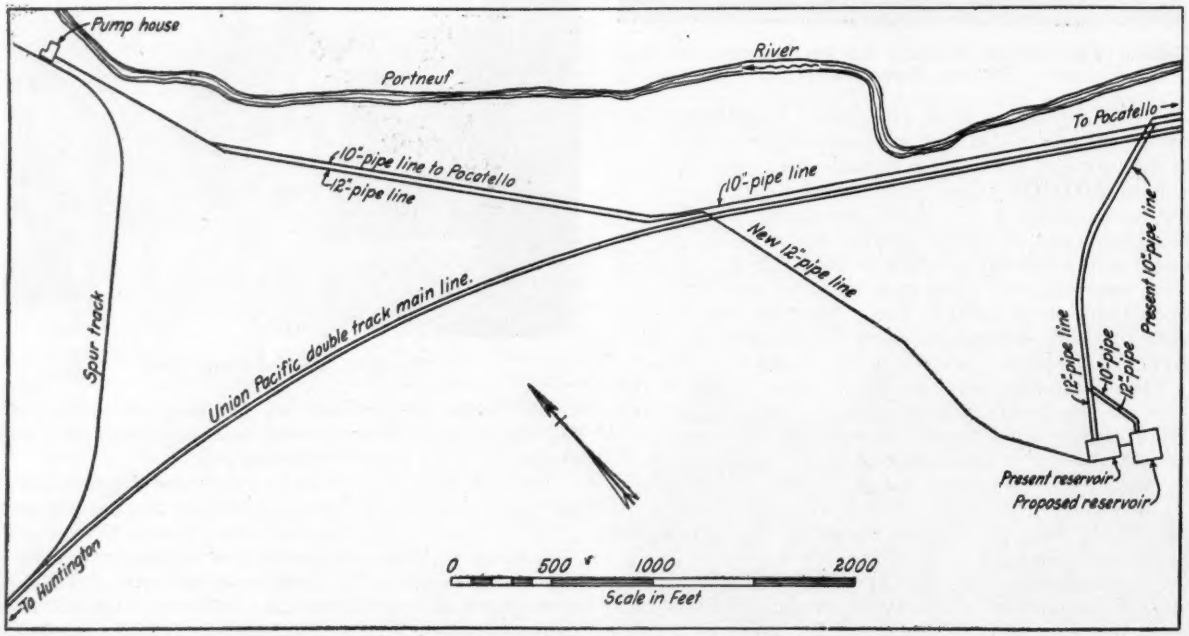
The new reservoir is 141 ft. 6 in. square with a depth of 20 ft. It is set into the hill, which is composed of lava rock covered with a considerable amount of soil. The walls and floor of the reservoir are entirely of concrete, the floor and those portions of the wall that serve as a facing or lining for the lava rock being of plain concrete and the walls in those cases being on a slope of one to one. But for those portions of the sides where the reservoir is not completely in rock excavation the walls are of reinforced concrete counterfort construction, backed on the outside with rock embankment 10 ft. wide on the top and sloped to an incline of one and one-half to one. The reinforced concrete counterfort walls are designed to withstand the water pressure on the inside to the full height with no support from the rock fill and also to withstand the pressure of the rock fill with no counterbalancing effect of water pressure on the inside. To increase the imperviousness of the reservoir the entire interior surface was given a coating of gunite.

The reservoir has a wooden roof supported on a system of columns spaced 20 ft. 6 in. in both directions. These columns are composed of 6-in. wrought pipe filled with concrete and provided with a ¾-in. cast iron sole plate held in place by a ¾-in. anchor bolt and equipped at the top with a cast iron cap affording a seat 15 in. square to take the roof frame. The latter consists of a system of double 4-in. by 12-in. girts spanning in one direction 12 in. above the water surface and 6-in. by 14-in. roof beams spanning in the crosswise direction, supporting 2-in. by 12-in. rafters spaced 2 ft. center to center, on which ⅞-in. D and M roof boards are laid. Sufficient knee bracing is provided to afford adequate stiffness to the roof construction.

The total cost of the reservoir is $100,000, some of the



Vertical Sections of the New Reservoir Showing Character of Concrete and Timber Work



Map of the Water Supply Facilities at Batise Springs

principal items of expense being 4,750 cu. yd. of earth excavation, 4,760 cu. yd. of rock excavation, 2,105 cu. yd. of reinforced concrete and 445 cu. yd. of plain concrete. This water supply development was designed and constructed under the direction of W. R. Armstrong, assistant chief engineer, Union Pacific (Oregon Short Line), Salt Lake City, Utah.

A Permanent File for Engineering Articles

By A. F. Ganier
Assistant Engineer-Design, N. C. & St. L., Nashville, Tenn.

IN THESE days when we are swamped with meritorious engineering literature, appearing periodically and in such volume that it is too much for a busy engineer to digest, any plan for solving the problem of making such literature more accessible for future reference may be of interest. I have studied various plans proposed or actually used to accomplish this purpose, but they have all seemed more or less involved or have required so much work as to make them unsuitable for application to a small office. I will therefore describe a system which I have put into effect in my office.

Secure from a dealer a standard vertical letter file, such as is used for filing correspondence. They may be obtained in wood or metal and in units of one or more skeleton drawers which slide back into a cabinet case to keep out dust. With the file should be purchased at least 100 tagboard folios with blank tabs projecting on top. On these tabs may be written a key number, described below, and if desired a brief description of the contents.

The most important part is making a key or index of the subjects which are to be clipped. The most satisfactory key and the one which permits of unlimited expansion will be an adaptation of the Dewey decimal system. Briefly, this consists of dividing the field of interest into nine parts, each of these is again divided into nine parts, and so on indefinitely until each subject is covered completely.

In the table is shown the method of classifying the subjects of interest in the engineering department of a railway. For lack of space the list of expansions into the third unit is not shown.

For small files, two units (drawers) are usually sufficient to cover the field, and it is rarely necessary to divide beyond the third figure. For example, the above key will give Number 72 as the proper one to mark on an article covering "Steel Highway Bridges."

Now take the periodicals to be clipped and with a sharp knife cut out the article to be kept, fixing together those of two or more pages with a pin through the upper left hand corner. Next, underscore with colored pencil the title of the article and mark the key number on the upper right hand corner. It is then ready to be dropped into its proper folio and requires no further attention.

In choosing the subject for the nine major divisions it is well to divide the field so that each will expand uniformly with the others. A copy of the "Key" should be hung on the side of the case for easy reference. It is apparent that the above system is self indexing, thus eliminating the work of indexing on cards.

In filing catalogs, I put them in the same kind of vertical file, with tagboard separators, arranged alphabetically. These alphabetical separators or guides come printed, in sets of 25, 40, 60, 80 and up to 240, depending on whether few or many catalogs are to be filed. The catalogs are dropped into their proper place according to the name of the manufacturer. If this does not appear on the cover it may be typewritten on a strip of paper and pasted on, at the top. Supplementing this, a card index should be prepared to cover the various materials and commodities.

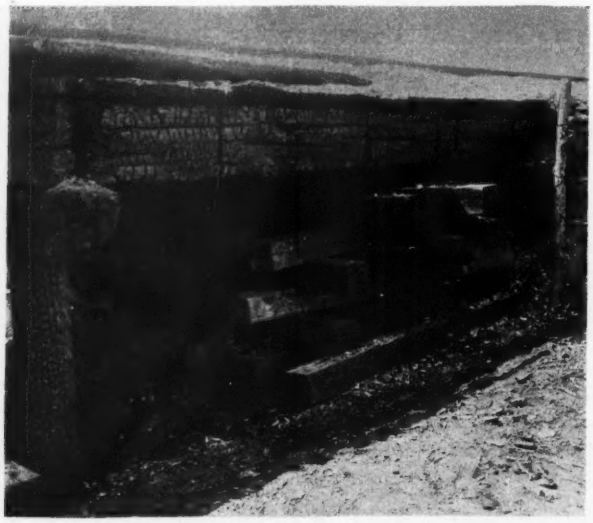
Key to the Clip File

10—Construction	11—Grading. 12—Steam shovels. 13—Cranes, pile drivers, etc. 14—Materials (cement, sand, etc.) 15—Concrete machinery.	16—Falsework. 17—Estimates. 18—Cal. methods, reports. 19—Miscellaneous.
20—Depots	21—Passenger depots. 22—Freight depots. 23—Combination. 24—Shelters. 25—Depot platforms. 26—Mail and express handling	27—Furnishings and fixtures 28—Materials (Paint 58) 29—Miscellaneous.
30—Shop Buildings and Shop Layouts	31—Engine houses, pits. 32—Machine shops. 33—Car shops. 34—Other shop buildings.	35—Ash disposal. 36—Register and locker rooms. 37—Oil houses. 38—Layouts. 39—Mcle. (lighting).
40—Miscellaneous Buildings	41—Section houses. 42—Tool houses. 43—Privies and septic tanks. 44—Signal towers. 45—High and low platforms.	46—Butterfly and umbrella sheds. 47—Icing platforms. 48—Other small buildings. 49—Miscellaneous.
50—Maintenance	51—Ties. 52—Rail, switches, etc. 53—Track appliances. 54—Ballast (except 14). 55—Work cars and trains.	56—Surface crossings. 57—Ditchers, weed burners. 58—Paint and Preservatives. 59—Mcle. (tools, curvature, concrete products).
60—Operating and Yard Layouts, Signaling	61—Locomotives. 62—Car Equipment. 63—Signs, posts, etc. 64—Scales. 65—Stock pens. 66—Fences, gates.	67—Signaling. 68—Clearance. 69—Mcle. (mail cranes, cattle guards, bumpers, etc.
70—Bridges and Culverts	71—Railway bridges, steel. 72—Highway bridges, steel. 73—Highway bridges, wood. 74—Concrete spans.	75—Trestles. 76—Turntables. 77—Piers, walls, etc. 78—Concrete and pipe culverts. 79—Mcle. (tunnels).
80—Fuel and Water Supply	81—Coaling stations. 82—Sand stations. 83—Water tanks and reservoirs. 84—Water cranes and valves. 85—Pumping machinery.	86—Pump houses. 87—Coal storage. 88—Water purification, etc. 89—Miscellaneous.
90—Miscellaneous	91—New railways. 92—Foreign railroads. 93—Drafting room practice. 94—Filing systems.	95—Organization. 96—Historical. 97—Instruments and surveys. 98—Personnel. 99—Miscellaneous.

Thus on the card entitled "Concrete Mixers," there would be a number of manufacturers' names. Usually, however, when one goes to the catalog file he has in mind the name of the manufacturer and does not have to refer to the cards.

Creosoted Bridge Withstands Fire

ABOUT a year ago considerable interest was manifested in a fire on the Nashville, Chattanooga & St. Louis, when a 108 ft., 9 span, creosoted timber ballast deck trestle, igniting from hot coals and fanned by a high wind, burned vigorously for a considerable period



The End Panels Were Supported on Cribbing Until Renewed

without serious harm. Bearing a rather striking resemblance to this incident is another trestle fire which occurred recently on the Ft. Worth branch of the Southern Pacific. This bridge was also built of creosoted timber and was of the ballast deck type, 150 ft. long and 15 ft. wide. It consisted of ten 15-ft. panels, each with twelve 8-in. by 17-in. stringers, covered by 3-in. by 12-in. decking and about 15-in. of ballast, and carried on five-pile

The Timber Was Uniformly Burned to a Depth of From 1 Inch to 1¼ Inches

bents, surmounted by 12-in. by 14-in. caps. All timber and piles had been treated by the full cell process with about 12 lb. of creosote per cu. ft. Catching fire from what is believed to have been incendiary origin, on September 4, only six months after its construction, this structure withstood flames for several hours without being damaged beyond recovery although it suffered considerably more than the earlier trestle.

The trestle is located about eight miles east of Ft. Worth, Tex. The fire was discovered at nine o'clock in the evening by a traveller on an adjacent highway, who informed the section foreman. He telephoned the officers at division headquarters and then proceeded with his gang to the bridge. Arriving about 9:30, he found the trestle completely enveloped in flames. Since there were no water barrels on the bridge, (it not being the practice of this line so to equip ballasted structures), the section gang found it necessary to go to a creek, about 450 ft. distant, for water. They carried this water to the bridge in buckets but found it impossible to make any headway against the fire. Meanwhile, conditions at the Ft. Worth terminal prevented the immediate dispatch of a switch engine and it was not until 1:40 a. m., that an engine arrived at the bridge. As soon as the switch engine arrived water was pumped on the fire from the engine tank, and the fire was finally extinguished at 2:30 a. m., five and a half hours from the time of its discovery, some additional delay having been caused by the necessity of the switch engine returning to Ft. Worth for a second tank of water.

The inspection of the bridge made subsequent to the fire disclosed the fact that the stringers, caps and piles

The Sway Bracing Was Burned Beyond Repair

in the first three bents at the east end of the structure and in a few panels on the west end were damaged to the extent of requiring cribbing up with ties in order to make the structure safe for passenger trains. This was principally due to the more extensive burning of the stringers near the ends, particularly where they rested on the caps. The five intermediate panels were found uniformly burned and charred, but not weakened sufficiently to require reinforcing, the charring ranging from 1 in. to 1¼ in. deep. The floor decking was charred on the underside to a depth of ¾ to 1½ in., but was not burned through except in two or three small spots. The sway bracing on all bents was practically destroyed, having been burned through at the point where contact was made with the piling. The accompanying illustrations show the condition of the structure as left by the fire, the bare spots on the timber indicating where charred portions were scraped away to determine the depth of the charring.

Comparatively little work was required to restore the trestle to service. The three panels on the east end and the two panels on the west end were rebuilt, but the five

intermediate panels are still in service with only slight repairs, consisting of the renewal of the sway bracing and shimming between the stringers and the caps. There is no excessive deflection on these panels when loaded with Mikado type engines weighing 210,000 lbs. on the drivers and it is thought that they will give several years' service before entire renewal is required.

Having withstood the fire in the manner outlined, the incident affords additional evidence as to the effect of creosoting on the fire hazard. The results appear to substantiate the belief that timber containing a considerable quantity of creosote will not be burned deeply as long as there is a sufficient supply of oil in the timber to be drawn to the surface. It is the belief on the Southern Pacific that the supply of creosote drawn to the surface and the supply of oxygen determines the strength of the fire and that the fire does not enter the wood so long as this fuel is provided on the surface. This makes it possible where a fire is discovered in a creosoted structure before too much time has elapsed to save it.

How the Pennsylvania Settles Disputes with Its Employees*

By Leo. I. Kennedy
General Chairman, Fraternity Maintenance of Way Men, Pennsylvania System

PRIOR to the period of Federal control, the maintenance of way men on the Pennsylvania were not organized, but as soon as general order No. 8 came out we tumbled into an organization. This was very likely on account of the war. More than that, it was a result of the progress that the transportation organizations had been able to make in dealing with the managements, while we had been on the outside. If a common, ordinary bridge and building foreman could get to talk to anybody higher than a division engineer in those days, he was going some. The other fellows were running the trains, while we were keeping the bridges up and the roadway and track clear; they were getting everything, and we felt we were on the outside. Approximately 85 per cent of the men on the Pennsylvania organized in a few months, until of about 40,000 maintenance of way employees close to 36,000 joined the organization.

In going through the period of Federal control we began to realize that something was wrong. We told our management, "We feel that the national agreements are going to be abolished. We also feel that we have had enough scrapping. We would like to get together with you and see if we cannot settle our differences among ourselves." We had two conferences—one in Philadelphia and one in St. Louis. It was evident at once that if we were to represent the employees on that system we had to be in a position to prove to the management and its committee that we were big enough to stand on our own feet, and that when we said we were going to do something we wanted to be able to do it.

Nearly All Employees Voted

Out of 42,000 eligible maintenance of way employees on the Pennsylvania system, 41,779 voted for the election of a committee. We elected a 100 per cent union committee of the United Brotherhood. The management did not object to that committee. It was practically the same committee that had been dealing with them during the period of Federal control; but every employee, whether a member of an organization or a non-member, was given the opportunity to vote, and many of them did vote. As soon as those committees were elected, a general committee was formed, and we were called to meet the management's committee at Broad street, Philadelphia. We were told to try to come to a satisfactory agreement concerning a set of regulations covering working conditions to take the place of the national agreement. We were in constant session for three weeks.

Those regulations which were adopted enabled maintenance of way men on our system to get together with our own officers for the first time. We obtained a systematic arrangement for the handling of cases. Arrangements were made yearly for dates upon which a committee of three division men met its superintendent once each month. If this conference fails to settle a case, a joint submission is prepared at once. The committee prepares its side and the superintendent prepares his. The two are then sent to the general superintendent once each month. Regional committees meet the general superintendent. If they cannot settle a case it goes to the general manager, and from the general manager to the reviewing committee. At the first meeting with the general manager, after those regulations were agreed to, 21 cases were settled across the table in one day. The maintenance of way reviewing committee consists of 16 men, 8 of whom represent the management and 8 the employees. Neither side has any advance instructions. At the first meeting of that maintenance of way reviewing committee, 22 cases were settled in one day. That is what has brought the closest relationship possible between employees and employer.

Agree on Wage Reduction

Not very long ago we were called in by the management. They said: "We are not making any money. There must be a reduction in wages. This question has been handled prior to this time by you men presenting arguments, by our side doing the same and both sides being questioned. We want you to agree to go out with our representatives and collect the necessary data. Collect in from the outside industries. Your man can suggest a plant. Ours will suggest a plant. We will compile the data so that there can be no question about it." This was done. When the conference came on, without regard to deciding whether we would accept a reduction in wages, the management laid their cards on the table. They gave us the data, not only of the wages paid in outside industries, but the condition of their road, the money they were making, the money they were spending, etc. We argued the question between us, and, thank God, we were big enough not to go to the Labor Board, or anybody else! We were big enough to get on our feet and accept a reduction in wages, and go back and face our men and tell them what we did.

Now, we come to the present day. The Labor Board, through organizations, has seen fit to say, "Two cents increase to certain maintenance of way men." We asked our management what position they were going to take.

*Abstracted from a talk before the New York Railroad Club.

They replied, "Come in with your committee, give us the desired notice according to your regulations, and we will listen to you." We prepared our brief on the proposition. We did not go in there with something simply off-hand. We found that if we expected to get anywhere we must try to prove to the management that the things we were after were positively necessary—that we were right. We presented our brief to the management. The management of the Pennsylvania was big enough to get up before a convention of maintenance of way men not very long ago and tell our committee that it was the best brief of its kind they had ever read.

Through this plan each one tries to understand the other. The cards are laid on the table and the committees go back and fight out with the men whatever they have agreed to with the management; and that helps the management. The principal part of the plan, as I see it, is to have committees made up of men big enough to stand pat on what they do when before the management and I believe that our management is big enough to live up to their word when they promise to do something.

Track Forces Face Spring Program of Work*

By J. W. Griffith
Roadmaster, Kansas City Southern, Pittsburg, Kan.

SPRING AND early summer track work consists primarily of the tightening of bolts, renewing ties and surfacing, lining and gaging track. If these items are taken care of in time they pave the way for summer and fall work. If work that disturbs the ballast or roadbed is done in the spring and early summer it stands up much better that if done at any other season. In addition, from 10 to 15 per cent more of this heavy work is done in a day if done before the heat of the summer.

First consideration should be given the tightening of bolts. As soon as the temperature rises to 40 to 50 deg. F. this work should be done. Bolts tightened at this time and in the fall when the temperature is about the same will hold much better than if tightened in the heat of summer or in the winter.

After this is done and the frost is out of the ballast, the track should be smoothed up and put in good riding condition. As it is assumed that all cleaning up work has been done during the winter, the next task is the renewal of ties. Consideration should be given this work before starting it to insure the required number of ties are piled at the most convenient places. This will be a great help, as the men will not have to stop making renewals to do this distributing.

We should know exactly how many ties each section has to put in and the forces should be distributed accordingly. One section may have 2,000 ties to insert while another section will have 3,000. In order that all sections may finish about the same time forces will have to be distributed according to the amount of work to be done, likewise one section will have more track to surface than another and this will also have to be taken into consideration.

Where track needs surfacing, the inserting of ties and the surfacing should be done at one operation, but where an average of only three or four ties are to be inserted per panel of track and track does not need surfacing, I favor digging the ties in as this saves ballast and time.

If a foreman has 3,000 ties to put in and inserts one tie per man hour, as we have done in the past, it will take a gang of six laborers 63 days to put them in. If they start March 15 and devote four days each week for this work, it should be cleaned up easily by July 1. About 15 days before beginning this work the roadmaster and the foreman should decide at which end of the section to start. If work was begun at the south end last year and the gang did not get all the way over the section, it should start this year at the north end and work south, Having settled this and the time having arrived for the starting of the work, the foreman should truck out sufficient tie plates for four or five days' work, being careful not to break the binder wires so that the plates will be scattered or covered up. He should then look over the track to determine if it needs surfacing or if the ties are to be spotted in and the track simply jointed up and lined.

He will then go over ties and mark those to be removed by striking them with an adz or marking them with chalk. Ties will then be distributed by push car, after which all of the force will start removing the old ties and inserting the new ones. If the track is not to be surfaced ties must be tamped when inserted without the plates being applied and the track may be dressed up before going to the next tie to be removed. When the number of ties for the day has been inserted, four men should drop back and spike the new ties, the foremen and the other men sorting and distributing the spikes and placing the tie plates on the new ties. This eliminates the "nipping" of the ties and gives the new ties a solid bearing. Two men with spike mauls will take the line side of the track, spiking the new ties and driving down all old spikes, while the other two men follow on the opposite side with a gage, putting the track to good gage.

In distributing the spikes care should be taken to place new spikes at joints and on the outside of the rail. The foreman should personally inspect the second hand spikes that are to be reused to see that none are scrapped that should be used and also that all that are to be reused are good. Where gaging is to be done and the spikes are pulled from ties the holes must be plugged. A bucket of creosote oil should be on the job at all times, and as, a plug is driven and adzed off this oil should be applied to the end of the plug to fill any opening around it that might catch water and thus cause the heart of the tie to decay. I find that we have to adze only a small per cent of treated ties to get an even bearing for plates but when this is necessary, hot creosote oil should be applied to the entire surface adzed.

Care should be taken to see that the plates fit the rail squarely and that the spikes do not lean and pull the plate towards the spiker and thus displace it. Foremen should personally inspect the old ties removed to see that none are fit for further use and at the same time check the dating nails. These ties should then be piled neatly and left for final inspection and disposal. Picks must not be used to pull ties under rails. Pick holes in any kind of wood start decay and shorten the life of the tie.

There are only three good reasons why ties should be removed from the track. (1) Decay. (2) Mechanical wear. (3) Damage by derailments. Of course some are burned out by hot cinders where ash pans are cleaned, but the first three charges are generally understood as the cause for the removal of most ties, and foremen should know that it is important that the causes of renewals are correctly given. When dressing track after tie renewals are made, the ballast should be distributed evenly and dressed at the top so that the work will look like a workmanlike job. All rail anchors that are not secure against the tie should be reset as this will be the last working the track will get for a year or more.

*Presented before the Kansas City Southern Maintenance of Way Association at Sulphur Springs, Ark., on March 3.

Creosote Shortage Tends to Curtail Preservation of Wood

Mixing Crude Oil With Creosote Will Conserve Supply and Afford Adequate Protection

By C. M. TAYLOR

Superintendent Timber Preservation, Philadelphia & Reading and Central Railroad of New Jersey, Port Reading, N. J.

THE INCREASING cost of creosote oil presents a problem to those engaged in wood preserving which would be serious enough if expense alone were involved; but the graver question of a shortage presents an issue that should be faced fairly and promptly, if the eighty million ties that should be treated chemically every year are to be preserved.

As long as dead oil of coal tar, called creosote, continued available, cheap, and satisfactory, it was used freely and the question of substitute oils was not considered. Furthermore, the "safety-first" idea of pure creosote oil

Condition of Long Leaf Pine Ties Treated With a Mixture of One-Third Creosote and Two-Thirds Mexican Crude Ebano Oil After Ten Years in Track.

was carried to a "pure-food-law" extent, until engineers generally have been educated to the belief that nothing but pure creosote oil should be used as a preservative for ties. The psychology of the situation lies in the fact that to date all attempts at specifications have been to fit the creosote oil produced, rather than to fix the manufacture of an oil for the use intended. Consequently a pure product has been specified on the supposition that only with such a one could there be safety and satisfaction in its use. However, no positive chemical or physical analysis has been developed to date which will prevent circumvention of the standard specifications if a manufacturer desires to deceive, and therefore oils not distilled from pure coal tar have been palmed off as pure creosote, creating in the industry a situation, too long tolerated by some and fostered by others, which has been excused on the score of the chemical complexity of pure creosote and its economic status.

To continue to treat cross-ties with pure coal tar creosote oils seems to be a waste, and the use of cheaper mixtures with certain petroleum oils has given results which justify its adoption by railroads. There seems good reason for believing that a 50-50 mixture of creosote oil and petroleum oils of the proper character can be relied on to prevent decay in any tie that is sound when accepted, properly seasoned for treatment, and thoroughly and evenly penetrated throughout its penetrable portions with an average of six pounds of the mixture per cubic foot.

Although cheapness alone would be sufficient to warrant the adoption of the creosote oil mixtures, there is a further great benefit to be gained by their use, and that is their fiber binding quality, as seen in a recent survey of the situation during which thousands of ties were examined. The usual brooming of the fiber seen in ties treated with zinc chloride varies with the different kinds of wood, but almost all zinc chloride treated ties have a dried out appearance, and in time the annual rings separate and the fibers of each ring come apart. This results in reducing the mechanical life of the tie and also increases the leaching of the preservative. The Card process did much to counteract this leaching and also worked wonders in fiber binding compared with the Burnett process.

Creosote oil used alone has proved a still better fiber binder and its superiority despite its greater cost is generally acknowledged; however it has been used in excess of any requirements for the prevention of fungus growth. Its fiber binding qualities vary with different creosote oils,

Sections of Perforated Douglas Fir Ties Treated With a Creosote Crude Oil Mixture, Showing Typical Penetration.

depending on their origin and pitch content. Mixtures of creosote oil and certain grades of petroleum oil seem to give better results in fiber binding than any of the pure creosote oils. Thousands of mixture treated ties in track with creosote oil treated ties show how much better preserved mechanically the mixture treated ties are, and provide sufficient evidence that the use of certain grades of petroleum oils mixed with creosote oil is not only a cheaper but a better proposition. Furthermore the protection against wood-destroying fungi by the creosote crude oil mixtures seems to be just as efficient as when straight creosote oil is used.

However, even if coal tar creosote oil is considered necessary as a basis for mixtures with petroleum oils, there is adequate assurance of safety if there is toxicity equivalent to one-fifth of a pound of creosote oil per cubic foot, the work of the Forest Products Laboratory proving this a minimum which would inhibit the growth

of Fomes annosus, a virulent type of wood-destroying fungi. Dean and Downes have developed supporting data along these same lines.

Millions of ties have been treated in this country with an average of five pounds of creosote oil per cubic foot, and a reasonable evaporation factor of 50 per cent at the end of ten years would leave only 2½ pounds per cubic foot, which means that any wood which has been thoroughly impregnated with creosote oil, no matter how great the evaporation and no matter how little oil was required to impregnate it thoroughly, has proved satisfactory. From the above it begins to look as if ties have been over-treated from a toxicity standpoint. Three pounds of creosote properly distributed has saved thousands of ties from decay and anything in excess of three pounds of creosote per cubic foot is, first a factor of safety and, second a fiber binder. Much data confirming the successful preservation of ties with the use of such small quantities of preservative oil thoroughly permeating the treatable portions of the ties can be had from individual tie weighings in connection with the installation of test sections on various railroads.

Past and present objections to so-called blast furnace oils, which run rather high in tar acids are sometimes based on failures supposed to be due to the use of blast furnace oils. These oils were used successfully in timber treatment for years, but owing to trade antagonisms have not been used so largely of late. There is no reason why, if toxicity is required in wood preserving oils and if the price is right, coal tars, water gas tars or petroleum oils cannot be combined with blast furnace oils in efficient and economical mixtures containing sufficient toxic properties, etc., to meet the general requirements and at the same time be relatively permanent.

Merely mixing any creosote oil with any petroleum oil is not the proper procedure, however. Some creosote oils mix easily with some petroleum oils and the mixture can be used readily and held in proper equilibrium by air agitation in the working tanks. Certain oils, however, are prone to precipitate a residuum when mixed with creosote oils, and crude oils having this tendency to a serious extent should be avoided. What is needed is an oil containing sufficient residue of such consistency that it will continue plastic enough throughout the life of the tie to act both as a fiber binder and as a moisture barrier, in addition to its preservative quality.

It will be remembered that the report of the Committee on Preservation of Timber, presented and accepted at the annual convention of the American Society of Civil Engineers in 1885, mentioned that even paraffin base oils saturating ties already in track extended the life of inferior woods several years. Also, in the recent developments of oil spraying of rail and track fastenings, much beneficial effect is noted where the oils spray the surface of the ties.

The problem of knowing when a safe and workable mixture oil is had will be a matter for chemical determination. The fact that such oils have been used successfully for years should be sufficient evidence that when properly performed the work of mixing and injecting them can be handled satisfactorily. The problems of temperatures and pressures to be used have to be studied as was the case when the industry began to absorb creosote oil mixed with coal tars and water gas tars.

When creosote oil is not available, the toxicity lacking in some crude oils can be supplied by mixing the latter with zinc chloride, calcium chromate, sodium fluoride or some other toxic medium. Water gas tar creosote and certain grades of low temperature tars can be mixed with crude oils and used with assurance of successfully preserving ties.

So far there is no known example of a failure from decay of a creosote crude oil mixture treated tie. The above leads to the conclusion that railroads need not depend entirely upon creosote oil alone for their tie preservation. Any of the mixtures mentioned could be made available promptly at a reasonable cost.

Some New Facts About Quick Setting Cement

DURING the last meeting of the International Railway Congress at Rome, Italy, mention was made of the use of a quick setting concrete known as "Ciment Fondu." This is a French cement which has certain characteristics which are distinctly interesting. Predominant among these is its ability to attain a usable strength in a very short period of time. In June, 1922, the Boston Elevated Railroad Company obtained some samples of this product and conducted a series of tests, the results of which are given in the tabulations.

The material was tested at the laboratories of the company in comparison with three well-known brands of American cement and with the specifications of the American Society for Testing Materials for 1921. Three different mixes of ciment fondu were used. Figures were obtained on the amount passing through a No. 200 sieve, the time of initial set and final set, the strength of the French cement after 24 hours, the strength of all cements of the one-to-three mix after 7 and 28 days, and the results of a five-hour boiling test. Separate tests were made of the one-to-two and one-to-one mixes

COMPARATIVE TESTS OF 1-3 MIXTURE

Make	Initial set	Final set	Per cent passing #200 sieve	24-hr. tensile	7-day tensile	28-day tensile
A. S. T. M...	*0.0 hr. 45 min..	†10 hr. 0 min...	78	...	#200	*300
"A" Brand....	2 hr. 40 min....	6 hr. 10 min.	85.2	...	348	377
"B" Brand....	2 hr. 50 min....	5 hr. 40 min.	85.4	...	271	300
"C" Brand....	3 hr. 20 min....	7 hr. 25 min.	85.0	...	282	356
French	3 hr. 5 min....	6 hr. 20 min.	96.4	376	423	...

*Not less than.
†Not more than.

COMPARATIVE STRENGTH OF DIFFERENT MIXES OF CIMENT FONDU

Mixture	24-hr. test	7-day	28-day	Per cent of of strength
1 cement 3 sand....	376 lb.	423 lb.	407 lb.	4.0
1 cement 2 sand....	578 lb.	725 lb.	671 lb.	7.25
1 cement 1 sand....	685 lb.	1,112 lb.	1,078 lb.	3.0

of ciment fondu. From the results it will be noted that the French cement obtained a strength in 24 hours greater than any of the standard cements did in 7 days and that the 7-day test of the French cement is greater by 15 per cent than the 28-day test of the others. On the 28-day test it showed a slight loss in strength compared with that at seven days. This cement, however, did not stand up well under the five-hour boiling test, as it cracked and scaled.

It was the intention of this road to secure some of this cement, if possible, for use during winter weather or for use in track work to shorten the time of from seven to ten days which is required with American cements before traffic can be turned on newly concreted or paved track. Communications with French manufacturers, however, indicate that the question of supply has not been stabilized and so far it has not been possible (at the time of this writing) to secure any of this material.

We are indebted to Edward Dana, general manager of the Boston Elevated, for information on these tests.

Producing Ties for Maximum Service

Strict Adherance to A. R. E. A. Specification and Systematic Methods Make for Uniform Product

ACTING IN the belief that it is not sufficient to produce and to treat ties strictly in accordance with the best specifications of the day, but that in addition some means must be provided to identify the ties so treated in order to demonstrate the value of these measures and to protect the purchaser from inferior materials or workmanship, the International Creosoting & Construction Company, Galveston, Tex., has adopted the practice of placing a dating nail bearing its trademark and the year of treatment in every tie leaving its plants. This innovation is particularly important to the users of treated timber because of the fact that inferior materials or treatment are detected only after several years, a condition from which the railways have suffered in numerous instances in the past. The identification of each tie marks a step forward in the production of quality ties at the present time, following as it does the policy of this company of producing ties only in strict accordance with the specifications of the American Railway Engineering Association. It also indicates a transition which is taking place in the entire tie-producing industry.

Fig. 1. The First Step—Felling Sound Trees.

The International Company is primarily a treating company with plants at Texarkana, Galveston and Beaumont, Tex., where it has been operating for more than a quarter of a century. Starting in 1905, it began to produce ties, since which time its operations have developed to the point where it is producing and treating up to three million ties annually.

Ties Must Be of Standard Quality

Before a company can afford to place a permanent mark on its product which will identify it during its entire life, good or bad, it must perfect its production methods to the point where it can insure satisfactory service. The policy under which this company is operating and which prompts it to thus trademark its product differs sufficiently from that commonly prevailing to warrant reference to its methods at some length in these columns. Most important is its acceptance of the A. R. E. A. specifications in their entirety and the exclusion by it of the production of all ties which do not conform to these specifications. This is carried to the point that no ties commonly classed as "serviceable rejects" are accepted at any price.

In the tie-producing area in which this company operates, within a radius of 300 miles of Texarkana, more than 90 per cent of the ties are manufactured by small producers, who cut a few at a time and exchange them at the nearest railway siding for their needed supplies. The International organization is composed of many thousand of these small producers, who bring their ties out to the siding and turn them over to the local agent of the company, usually the banker or the merchant in the small community. The company takes all the ties this agent can buy, paying him the published prices. Its representatives also aid him in producing ties himself, accompanying him into the woods to look over timber and assisting him in securing help to cut the ties.

Fig. 2. Cutting a Tree Into Proper Lengths for Ties.

Fig. 3. Hewing the Tie Carefully to Dimensions.

Inspectors visit each of these towns weekly and grade all ties, paying cash for all accepted. No ties are accepted for inspection when stacked closely, but it is required that they shall be piled openly so that any defects will be apparent. Each inspector works with a helper and each tie is inspected for its entire length from both ends.

Instead of indicating the grade by chalk marks,

which are soon lost, the grade is marked on each tie permanently with paint, which marks the ties carry through the treating cylinder to the track, showing the railways that there has been no regrading after they have been taken up from the small producer. This inspection is made by the use of a measuring rule by men familiar with the characteristics of the timbers in this area and who remain in the same territory from year to year and thus become known to the producers. All ties are purchased from the woodsmen at prices posted publicly, so that they

Fig. 4. Each Tie Is Inspected from Both Ends and Graded With Permanent Markings.

can know at all times what they will receive. Contrary to the fear expressed in some quarters, the rigid inspection has not been found to discourage production after these small producers learn what is desired. Neither has it been found necessary to resort to the practice of "grading up" ties or increasing the prices above the market of the day in order to get specification ties. The value of an organization such as this, known to and having the confidence of these small producers and paying cash on delivery of the ties, was evidenced during Federal control,

Fig. 5. Ties Are Seasoned in a Large Central Yard Under Close Supervision.

when the International Company was able to buy for and at the request of the government and in competition with it, large numbers of ties at a price five cents below that which the government itself was paying in the same territory and which it had posted throughout the woods.

Following acceptance, the ties are loaded onto cars and shipped quickly from the decay-producing conditions of the forest to the treating yard, where they are seasoned and treated according to approved standard practices. The interval between the time the ties are cut in the woods and their piling in the seasoning yard at the treating plant is often less than two weeks. At this point storage is provided for 2,500,000 ties, which is not only adequate space for the seasoning of all ties on order, but also enables the company to accept and store a considerable number of additional ties which it takes from the producers when the roads are buying only limited quantities, thereby tending to stabilize prices and output.

All of these measures are steps in the development of a plan for the production and merchandising of ties according to a definite system whereby they can be delivered to a road subject to inspection at the point of delivery on a specification which is capable of accurate and uniform interpretation at all times. It is the thought that the permanent identification of the product will make it unnecessary for a road to send inspectors into the woods to pass upon the ties before treatment and into the treating plant to insure that the proper amount of preservative is injected into the timber in the approved manner, the elimination of this inspection saving the roads at least five cents per tie. In other words, this plan contemplates the sale of a finished product rather than the performance of a service and the dating nail in each tie is a permanent identification mark by means of which the quality of this product can be ascertained at any time.

Canadian Railway Association Issues Motor Car Rules

APPROVED by the Board of Railway Commissioners of Canada to assist in establishing safe practices in the handling and operation of motor cars, the Railway Association of Canada has drawn up the following regulations governing the use of all motor cars, hand cars, velocipedes and push cars and recommended they be adapted as standard on the several Canadian lines:

1. No motor car, hand car, or similar vehicle is to be operated on the railway without permission of the proper authority. Each vehicle of this character must be placed under the control of one individual who will be responsible for its operation.

2. No person or persons, except employees in the discharge of their duties, shall be allowed to ride on such cars on the tracks of the railway unless holding special permission from the proper authority.

3. The person in charge of the operation of the car must, when practicable, inform himself of the movement of trains.

4. Immediately after starting, brakes must be tested, to insure that they are in proper working condition.

5. All cars not in actual use must be lifted off track, or otherwise placed clear of passing trains. They must not be left on or near road crossings. When unattended, they must be locked, and the key retained by the person authorized to use the car.

6. When approaching railway, street, and highway crossings and switches, cars must be under full control and prepared to stop immediately. Cars must not be run over crossings protected by gates until the gates are down, or even crossings protected by flagmen until given the "Proceed" signal by the flagman.

7. Cars loaded with rails, frogs, ties, or similar material, must not go on the main track without protection, as set forth in the company's rules.

8. Rails, frogs, or similar material must not be carried on motor or hand cars, except in cases of emergency. Water kegs, track jacks and other tools likely to derail the car if they were to fall off, must be carried on the side or rear of same.

9. Motor, hand, or push cars must not be attached to a train.

10. Cars must not be run after sunset, or during foggy or stormy weather, except in cases of actual necessity. In such cases, on single track a red light must be displayed to the front and to the rear, and on double track a white light to the front and a red light to the rear. During fogs and storms, flagmen should be sent out in each direction, and the car run no faster than these flagmen can walk.

11. A distance of not less than 500 ft. must be maintained between motor cars and between hand cars or velocipedes following a moving train; and of not less than 250 ft. in the case of hand

cars and velocipedes moving in the same direction on the same track.

12. Motor, hand and velocipede cars must be run with great caution around blind curves, and must be stopped frequently so that approaching trains may be heard.

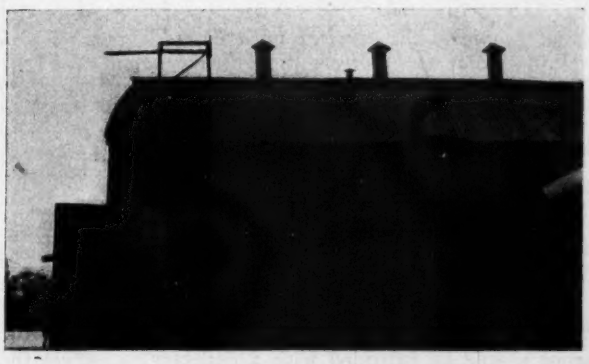
13. Hand cars, unloaded push cars, and velocipedes must be passed from one track to another by lifting, instead of by turning switches. When necessary to use switches, they are to be turned only under supervision of the foreman, who will be held responsible for seeing that they are left set and locked in proper condition.

14. In all cases a lookout must be kept in each direction, whether on single or double track.

Rules 3, 7, 10, 12 and 14 do not apply to motor cars operated by train order.

Old Roofs Afford Interesting Study

AN UNUSUAL case of long life in metal roofing has recently come to light in an inspection made of the roofs of a number of old buildings of the Houston & Texas Central (now a portion of the Southern Pacific) at Houston, Texas, by representatives of the Armco, Culvert and Flume Manufacturers' Association, Chicago. These buildings were erected in 1880 or 1881, and were roofed with galvanized iron applied in strips having five-inch corrugations, a type of roofing of which very little has been made for at least 30 years. The roofing, including the galvanized coating, although now over



The Machine Shop and Wheel Room Upon Which the Corrugated Iron Roofing is Forty Years Old

40 years old, is still in almost perfect condition. It is in much better condition, in fact, than many galvanized roofs, which have been in service under similar conditions for only four or five years.

This remarkable record of service quite naturally aroused curiosity as to the probable reasons for it and suggested an investigation into the character of the old material with special reference to its comparison with the corrugated metal largely employed for building purposes at the present time. Samples were accordingly cut from this old roof and from other railroad buildings in Houston, upon which the roofs were only a few months or a few years old, and were sent to a testing laboratory, where chemical examinations were made. The results were as shown in the table:

	Sample B per cent	Sample H per cent	Sample O per cent
Sulphur	0.052	0.017	0.074
Phosphorus	.066	.091	.104
Carbon	.07	.012	.08
Manganese	.402	.021	.387
Copper	.018	.028	.006
Silicon	.016	.116	.020
Wt. of coating, ozs. per sq. ft.	1.24	2.68	1.43

Sample B was 25-gage, galvanized metal, taken from the roof of the frog house of the Texas & New Orleans at Houston, where it has been in service about four months. Sample O was 24-gage galvanized metal, taken from the roundhouse of the Houston & Texas Central on Houston street. Sample H was 21-gage galvanized metal, taken from the Houston & Texas Central machine shop and wheel house and constituted some of the old five-inch corrugated iron.

An analysis proved the metal in Sample H to be fairly well entitled to the designation of pure iron, being very low in sulphur, carbon and manganese, and with the com-

The Roofing On the Old Foundry is Still in Almost Perfect Condition

paratively high silicon and phosphorus content characteristic of much of the old-time material. As compared with this, samples B and O were found to be steel. The analysis also disclosed the presence of an especially heavy coating of zinc in the case of the old iron, twice as heavy as that used on the two specimens taken from the frog house and the round house.

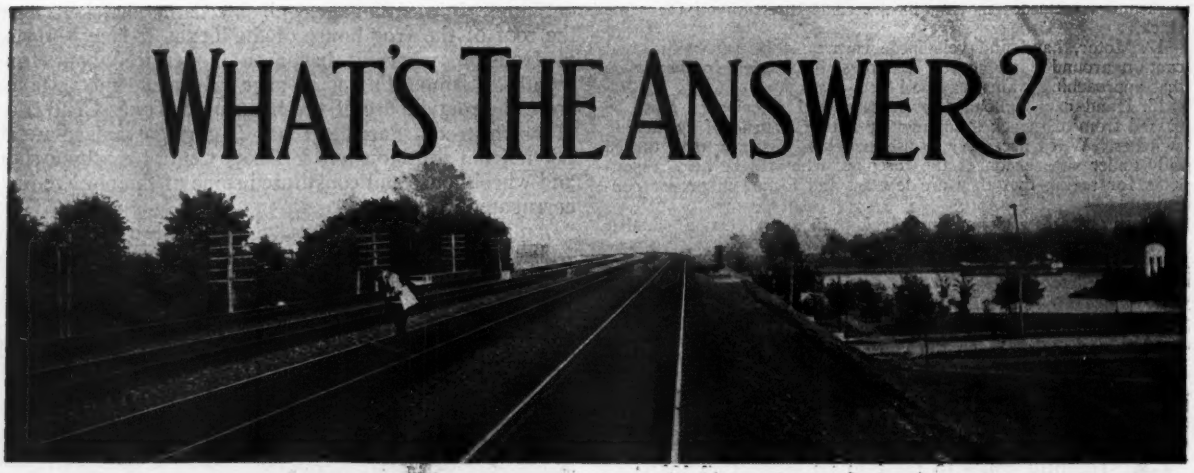
After the above mentioned analyses had been received it was thought well to have samples of the old roofing on the other buildings analyzed in order to be sure that Sample H, which came from the machine shop, was characteristic of the material as a whole. Accordingly, three more samples were taken, No. 1 from the storeroom, No.

A Close-Up of the Roofing On the Store House

2 from the old pattern shop and No. 3 from the foundry building. The report received on these was as follows:

	Sample No. 1 per cent	Sample No. 2 per cent	Sample No. 3 per cent
Sulphur	0.031	0.024	0.019
Phosphorus	.131	.135	.132
Carbon	.020	.025	.018
Manganese	.063	.069	.024
Copper	.044	.022	.019
Silicon		.122	.168

It is evident from this investigation that the old iron on the buildings is substantially of the same character.



This department is an open forum for the discussion of practical problems of engineering and maintenance of way. Readers are invited to send in any questions which arise in their work in the maintenance of tracks, bridges, buildings and water service. *Railway Engineering and Maintenance* also invites the co-operation of its readers in answering any of the questions listed below.

The following questions will be answered in the June issue:

(1) What is the practical slope for the bottom of roadway ditches?

(2) Under what conditions, if ever, should flanged end cast iron pipe be used for pump suctions from creeks or rivers?

(3) How may piles be sawed off under water without requiring the services of a diver?

(4) What are the relative merits of wood and steel for water tank towers of ordinary height?

(5) To what extent have explosives been found useful in clearing railway lines of heavy snow drifts?

(6) In about what proportions does the cost of digging pipe line trenches increase with the depth under average conditions in earth, sand, gumbo and rock, respectively?

(7) What is the function of reinforcement in a concrete pier for slab bridges?

(8) When estimating the cost of constructing various railway buildings is it a safe practice to figure the cost of erection as a certain percentage of the entire cost of material and, if not, what is the preferred method?

The Proper Arrangement of the Supply Line in Water Tanks

Is it preferable to extend a water supply line to a storage tank above the level of the tank bottom, and if so, is it more economical to project it through the tank or carry it up on the inside?

First Answer

The discharge line should extend to the top of the tank in most instances, to avoid the need for a check valve near the pump. It is much easier to drain such a line when it becomes necessary to work on it, especially if in treated water districts, as valves on treated water lines seldom hold tight. It is of course necessary to provide a means of draining the portion in the tank during cold weather to prevent freezing.

On new construction it is more economical to carry the line up through the bottom of the tank. On a tank already constructed it is cheaper to run it up on the outside.

Water Service Engineer.

Second Answer

A supply line to a storage tank should extend above the floor of the tank a distance depending upon the style of tank and velocity of flow in the supply line. There is always a certain amount of sediment which settles to the bottom of the tank, and which is churned up and mixed with the water above it unless the mouth of the supply pipe extends above the floor. The mouth of the pipe should be provided with a deflector to deflect the flow of supply and avoid as much as possible the suction.

Whether the supply line should be projected through the floor or carried up on the outside depends upon other conditions. If the supply is by gravity without an altitude valve, it is better to carry the pipe up on the outside to facilitate repairs and avoid the tendency to leak about the hole cut through the tank floor. Wooden tank floors usually rot first around such holes. Unless the supply line runs continually with force enough to prevent freezing the inlet should be through the bottom of tank for such lines are more easily boxed to protect them from freezing.

C. J. LEPPERD,
Supervisor, Philadelphia & Reading, Pottstown, Pa.

The Proper Thickness of Plank for Highway Crossings

What thickness of plank is most economical for highway crossings?

First Answer

Four-inch plank is the most economical for highway crossings. It requires less shimming than the three-inch plank and is much more substantial and firmer. Also the four inch plank is considerably stiffer, thereby meeting more adequately the present heavy traffic. The ex-

tra cost of the four-inch plank is more than offset by the labor saved in shimming. As a large percentage of the rail in present use is six inches high, a three-inch plank would need three inches of shimming, while a four-inch plank could be easily shimmed with one piece of two-inch block.

GEORGE T. DONAHUE,
Assistant Supervisor of Track, New York Central, Rochester, N. Y.

Second Answer

For crossings where full planking is deemed necessary, four-inch planks are most economical, riser strips of good material and the full width of the ties being used to bring the planks to the proper height. Planks so placed should be bored for spiking, the spike hole being made of sufficient depth to penetrate the riser strips and to avoid splitting or checking of the planks, riser strips or ties.

P. J. MCANDREWS,
Roadmaster, Chicago & North Western, Sterling, Ill.

The Drop Hammer vs. the Steam Hammer

What are the relative advantages of the drop hammer and the steam hammer?

First Answer

On first thought, one is inclined to say that there are no relative advantages of the drop hammer over the steam hammer. However, some concessions must be made in favor of the old style drop hammer. For instance, it takes up about 4 ft. of headroom as against about 11 ft. for a steam hammer, which means that the "leads" must be 7 ft. longer to handle the same length of pile. its weight is only one-half as great, consequently a heavier pile can be handled at a greater radius with the same degree of safety. Also the blow is greater, and in certain kinds of soil, the drop hammer has driven piles where the other failed.

However, the steam hammer has many advantages that makes its general use much more desired. Its additional weight resting on the pile, together with the rapidity and regularity of the blows, practically keeps the piling going down all the while, thus overcoming the friction much more readily than the slower drop hammer which allows the soil to settle in around piles during interval between blows. Especially is this true in sand or sandy soil. The general wear and tear on the machinery, and, incidentally, on the operator, are very much lessened. A drop hammer is particularly hard on cable and sheaves, and the treatment of the pile itself is much more severe, especially if of concrete.

R. E. SHEEHAN,
Supervisor of Bridges, Chicago, Burlington & Quincy, Chicago.

Second Answer

A drop hammer is made of cast iron weighing from 2,500 to 3,500 lbs. The hammer is raised to a height of 12 to 35 feet and then allowed to drop on the head of the pile. A hoisting engine is used to raise the weight, but the effectiveness of the blow is reduced considerably by this method of raising as the weight in falling drags the rope or cable and also turns the hoisting drum as it falls. The disadvantage of this is that the blows are infrequent, about 18 or even as low as eight per minute.

A steam hammer is much more effective and economical. The hammer is attached directly to a piston in a steam cylinder, and weighs about 3,500 lbs. It is raised by steam the full height of the cylinder and then allowed to drop. Depending entirely on the character of the work to be done, the weight of the hammer is sometimes double that of the drop hammer. The blows are very rapid, about 45 to 70 per minute, and the height of the fall is less. The ultimate resistance is just as great as that secured by the drop hammer, and the driving is much more rapid.

In driving the drop hammer will invariably crush the heads of wooden piles and spall and crush concrete piles although there is a cushion between the driving block and the concrete.

There is an advantage in using the steam hammer as greater speed and accuracy are obtained, also shorter length piles can be used as no allowance has to be made for crushed heads which are eliminated by the use of the steam hammer and also the wear and tear in general on the driver is less.

F. H. CRAMER,
Assistant Bridge Engineer, Chicago, Burlington & Quincy, Chicago.

The Care of Bridge Expansion Bearings

What measures are necessary to keep expansion bearings on steel bridges in condition for free movement?

The prime essential in the maintenance of expansion bearings is that the bearings are of a practical and efficient design and are properly installed, for when these conditions are met, very little attention should be required to keep the joints in proper working order. When installing the joints and in later inspections, particular attention should be given to see that the bearings are placed normal to the direction of movement, as skewed rollers are a likely source of trouble, causing undue and uneven wear of the bearings and obstructing the free movement of the bridge.

After installation, such attention should be given the joint as will keep it free from rust, dirt or other material having a tendency to increase the frictional resistance or obstruct the movement. In other words, such maintenance should be given the joint as will keep it in the condition the designer intended it to be.

The use of oil or other lubrication is of doubtful value in joint maintenance, properly designed joints being capable of doing efficient work without lubrication. The amount of inspection which joints should receive, will, of course, depend upon the conditions. As a general rule it is sufficient to say that a joint should be inspected often enough to assure the engineer that it is working properly.

C. F. LOWETH,
Chief Engineer, Chicago, Milwaukee & St. Paul, Chicago.

The Merits of Rope and Chain for Roadside Tank Spouts

Is rope preferable to chain for pulling down roadside tank spouts and opening the tank valve?

First Answer

It has been the practice of the Illinois Central to use rope exclusively in preference to chain, both for pulling down the tank spouts and for opening the tank valves. Chain is used only for the purpose of counterweighting the spout, the chain being attached to a ring on the discharge end of the spout and run over a sheave on the tank frame to the counterweights.

The enginemen always prefer the rope to the chain. Probably the principal reason is the greater ease with which the rope can be handled. The rope is more flexible and is much easier to grip than the chain. This is quite important where the fireman wears gloves or where, for some reason such as the height of water on the tank valve, considerable pull is required to open the valve. Another advantage of the rope over the chain is the quicker response usually obtained in opening the tank valve, the chain giving a jerky motion, where the rope

gives a steady one. Also where rope is used, there is less trouble during bad weather because of slipperiness due to the presence of ice on the chain, and there is less chance of a fireman suffering injury if he should leave his gloves in the cab and grasp the frost-covered links with his bare moist hands.

The safety feature is also in favor of rope, particularly in the case of rope used for pulling down the tank spout, as there is less likelihood of a man slipping by losing his grip when pulling down the chain, or suffering injury if the rope should strike a brakeman while passing by on a train. Where much windy weather is encountered, the rope is also preferable to the chain because there is less noise from its rattling and striking against the tank body or the metal spout. The chain may stand up longer under service, but this is of minor importance. On the Illinois Central we simply give the enginemen what they like the best in this respect.

W. B. BRYANT,
Water Inspector, Illinois Central, Chicago.

Second Answer

[Editor's Note: A study involving this question was recently made by the Santa Fe. Replies to inquiries made of various roads showed that of the 13 roads disclosing their practice, 10 roads use rope for tank spout pulls, two use chain and one road uses cable. These roads are as follows:

Canadian Pacific, rope.
Chicago, Milwaukee & St. Paul, chain.
Chicago, Rock Island & Pacific, rope.
Great Northern, $\frac{7}{8}$-in. chain with 3-in. ring at end.
Illinois Central, ¾-in. and 1-in. rope.
Kansas City Southern, rope.
Missouri, Kansas & Texas, ¾-in. rope.
Missouri Pacific, ¾-in. rope.
Northern Pacific, ¾-in. rope.
Norfolk & Western, ¾-in. rope.
Southern, ½-in. flexible cable.
Texas & Pacific,, 1-in. rope.
Wabash, rope.

The Southern Pacific reported that it had found the flexible cable satisfactory, the firemen grasping this cable by means of a hook. The Kansas City Southern reported having tried equipping locomotives with hooks for use in pulling down spouts, but found this method unsatisfactory because of the frequent loss of the hooks. The replies disclosed that one road has tried the use of a small brass chain for pulling down spouts, but abandoned this practice because of the frequent renewals required due to loss by theft. Both the Illinois Central and the Northern Pacific reported the practice of wrapping the end of the rope with cord or wire to prevent it fraying, the objection to tying a knot in the end of the rope being the greater tendency of the rope to catch on something when blown by the wind. In addition to rope, the Rock Island also reported the use of a chain equipped with an eight-inch ring on the lower end. While the practices varied somewhat on the different roads, the consensus of opinion appears to be largely in favor of the use of rope, both for pulling down the tank spouts and for opening the tank valves.]

Replacing Bunk Cars with Portable Camps

To what extent is it practical to replace bunk cars with portable camps to house extra gangs?

I consider it highly desirable and practical to replace bunk cars with portable camps to house extra gangs on all work where moves are infrequent, and especially where short hauls are necessary as in the case of rail and ballast gangs—moving camps to keep the men in close proximity to the work. Not only do I consider the portable camp to be a practical proposition so far as keeping men closer to the work is concerned, but that it would be economical as well, assuming the camp house properly built.

Bunk cars as a rule, are very poor at the best and cost about as much each year as the camps in proportion to the number of cars fitted up. For example, each year, the cars are fitted up for the season's work; the doors and windows are screened, stoves and bunks are provided and the kitchen and dining cars fitted up with tables, benches, shelving and other facilities essential for meeting the requirements of an outfit of this character. When the work is finished in the fall, the gang is disbanded, the cars are moved into terminals and placed on back tracks without any protection being afforded to prevent theft and maliciousness on the part of irresponsible persons. Consequently when the cars are again needed in the spring, it is usually found that the stoves and fittings previously placed in the cars are missing.

With portable sectional bunk houses that can be readily taken apart or set up, this problem can be solved, as the houses can be dismantled without much expense and the fittings turned into local stores to be held for the following season's use.

ROBERT H. FORD,
Assistant Chief Engineer, Chicago, Rock Island & Pacific, Chicago.

Shop Painting Steel

Is the shop painting of structural steel for bridge building and tank work always desirable?

First Answer

It is the view of our bridge engineer, in which I concur, that all steel which is to receive a field coat of paint when erected should have a shop coat applied at the shop as soon as possible, so as to prevent any corrosion from starting.

With steel which when erected is to be encased in cement or concrete, it is our view that it should not be given a shop coat of paint. The rust that develops should be carefully cleaned off at the time the metal is being encased with cement or concrete after erection.

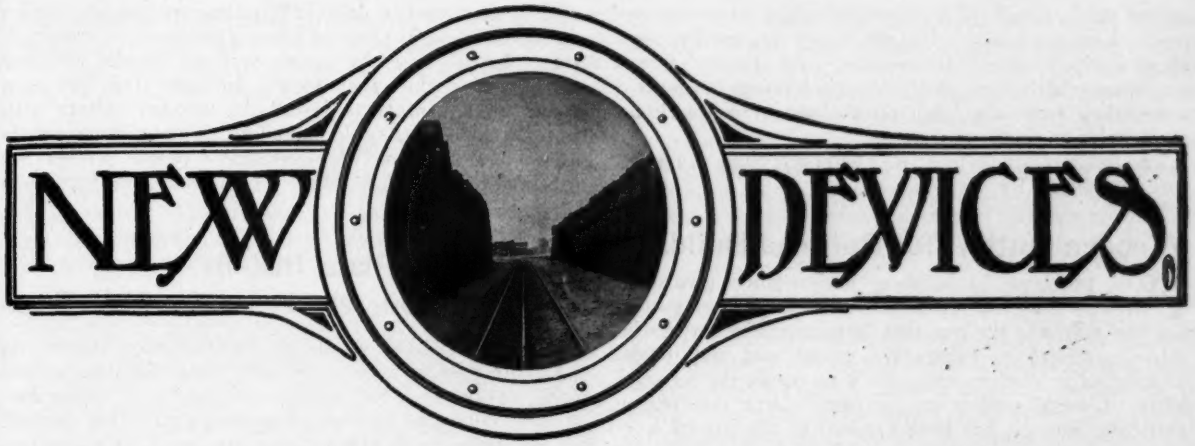
R. B. ROBINSON,
Engineer Maintenance of Way, Union Pacific, Omaha, Neb.

Second Answer

Where steel tank construction is undertaken, the best results are obtained by leaving the steel plate unpainted until after erection, the riveting of the plate and the subsequent rusting of the metal having a tendency to loosen any mill scale from the plate, thereby putting the steel in a better condition to hold paint subsequently applied. When this practice is followed the painting should be done after removing any rust or scale still adhering to the plate. Where the plates are shop painted prior to erection, the mill scale remains on the plate, thus rendering any field painting less perfect as a protective coating because of the imperfect adhesion to the steel by reason of this scale.

The usual practice, however, is to shop paint such material, owing to the desire of the railroads to place the tanks in service as soon as possible rather than to keep them out of service until the mill scale has loosened under the influence of the weather. In order to meet this condition some manufacturers endeavor to fill orders for tanks from plate which has purposely been left exposed to the weather long enough for the scale to have become loosened before the shop coat of paint is applied.

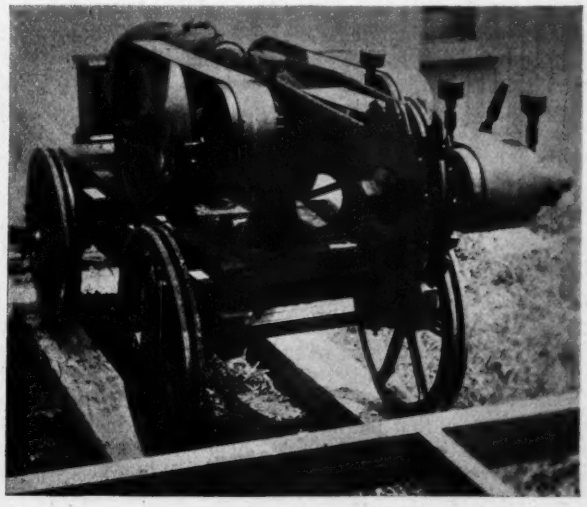
M. J. TREES,
Vice-president, Chicago Bridge & Iron Works, Chicago.



An Improved Timber Dapper

A NUMBER of improvements have been made in the Toohey timber dapper which aid materially in its accuracy of cut and ease of operation. Among these changes the standard pressed steel car wheels have been replaced by grooved wheels which run upon an angle or "T" iron track, thus eliminating the possibility of shavings or chips interfering with a smooth surface for the wheel tread.

The original machine was belted direct from a pulley on the engine to a pulley on the mandrel and the hinge



The Improved Toohey Timber Dapper

or rear end of the cutter arm was about one foot forward of the axis of the engine shaft. Thus any movement of the arm up or down resulted in a change in the tension of the belt. To obviate this a countershaft was introduced at the hinge point of the arm and belts now run from the engine to the countershaft and from the countershaft to the mandrel.

On the first machine, a screw arrangement was used to support the arm and also to adjust it up or down. This shaft held up the arm but did not always hold it down. To overcome this the cutter arm was extended 12 in. back of the bearing point and a toggle joint arrangement introduced for adjustment and to hold the arm in both directions.

The new machine utilizes a 5 hp., two-cycle engine instead of a 3½ hp., four-cycle motor as before. This gives more power and enables it to be belted direct from both fly wheels to the countershaft and from the countershaft to the mandrel at the center of the arm, giving an equalized and balanced drive. The diameter of the cutter head has been increased from 10 in. to 12 in. in order to secure additional depth of cut where needed.

A Switch Point Protector

ONE OF THE recent developments of interest to those responsible for the maintenance of tracks is a device designed to protect the points of switches from wear and thereby to increase their life. This device, which is known as the Mack Switch Point Protector, consists of a manganese steel casting, shaped to conform to the head of the rail and fastened to it by four bolts, the heads of which rest in a channel plate conforming to the space between the web and the head of the rail.

This device is designed to take the wear resulting from the thrust of the wheels and to pass the wheels by the switch point. In addition to reducing the wear at the

The Mack Switch Point Protector in Place on Running Main

points of the switches, it is also claimed to offer a certain amount of protection against derailments while affording no obstruction to main line traffic.

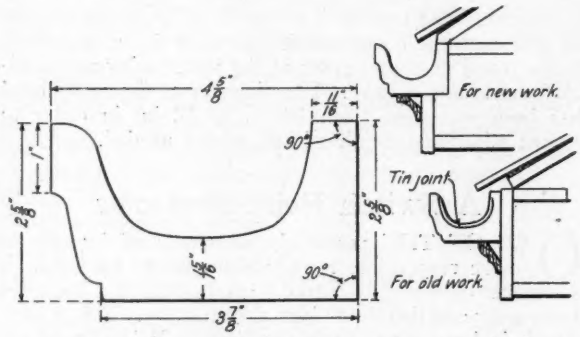
The device was invented about two years ago and has been tested on about a dozen roads since that time, with results that are reported to be favorable to its use. In one case it is reported to have been in use for two years without requiring the switch point to be changed, where it was necessary to renew the points every six or eight weeks before. A case is also reported on the Delaware & Hudson, where one of the devices was installed on a

ladder track ahead of a switch in which shop-repaired points were used, which had previously required renewal about every 30 days. In this case four months' service was obtained from the protected switch points before they were taken from the track on account of a wreck not attributable to the protector.

The device is made by J. R. Fleming & Sons Company, Inc., Scranton, Pa.

Wooden Gutters for Railroad Buildings

FEW problems in building maintenance give more trouble than the repair and renewal of roof gutters. On the railroads the question is particularly serious because exposure to locomotive smoke and the deposit of locomotive cinders upon roofs increases the susceptibility of metal gutters to corrosion. For this reason, particular interest has been aroused in the use of wood



The Gutter and Two Methods of Applying It

in the construction of gutters. One manufacturer of mill work, E. M. Long & Sons, Cadiz, Ohio, has made a specialty of wooden gutters, first producing a so-called standard gutter with an O-G curve and more recently adopting an "improved" design that lends itself more readily to architectural treatment as a part of the building cornice. Almost simultaneous with this change was the adoption of Douglas fir as the material from which the gutters are made, as it was found that that species of wood was especially suited to the purpose. The "improved" gutters are made of three standard sizes, 3 by 5, 4 by 6, and 5 by 7, the figures representing the dimensions in inches of the timbers from which these sizes of gutters are worked.

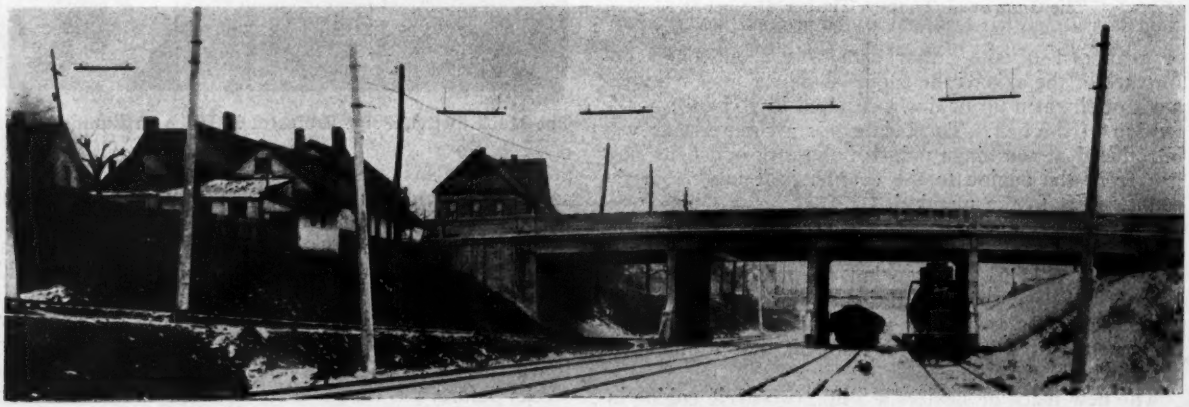
When installing the gutters in a new building the present practice is to incorporate the gutter in the cornice construction as shown in one of the illustrations. This, of course, cannot be done in installing wooden gutters on an old building in place of some other form of construction. In this case the gutter must be usually attached as shown in the other view. In general it has been found an advantage to install the wooden gutters with as little slope as possible, installing as many down-spouts as may readily be accomodated. Wood screws are preferable to nails or spikes, for fastening the gutters in place.

The Nickel Plate Installs Concrete Poles for Tell Tales

THE ABILITY that lies in the adaptation of concrete for railway service for other uses than for monolithic work and particularly in post and pole construction, has had a rather interesting application recently in connection with track depression work in Cleveland, Ohio, where the New York, Chicago & St. Louis has installed 54 concrete poles to support bridge warnings. In this case the poles, aside from satisfying the engineers from standpoints of durability and low maintenance costs were selected largely for the extent to which they fit into the general architectural scheme, all the viaducts included in the track depression work being made of concrete.

The poles are of the "Hollowspun" type of construction, the essential feature of which is the placing of a wet mixture of concrete in a form containing reinforcing steel and revolving at a high rate of speed, an operation which both serves to compact the concrete around the reinforcing steel and to leave a cylindrical opening throughout the length of the pole to reduce the weight and attendant inconvenience in handling. The poles are 35 ft. long with 6-ft. ground penetration and were designed for a strain of 2,000 lb. applied two feet from the top. While the bridges provide for eight tracks ultimately, only four are now in service, and the warning poles were consequently spaced only far enough apart to clear these four tracks. They were set with a "rake" about two feet away from the center.

In setting the poles, the labor gang first dug the holes 3 ft. sq. and 6 ft. deep. The poles as received were then unloaded with locomotive crane at the point of erection, following which a gang of bridge riggers, utilizing a locomotive crane, set them in place with the bottom the proper distance below the base of rail. Finally a concrete gang followed up the work of the bridge riggers and filled around the poles with concrete, finishing up the top with form work so that the base would present a neat appearance above the finished grade. The lower six feet was given a coating of waterproof paint to facilitate breaking

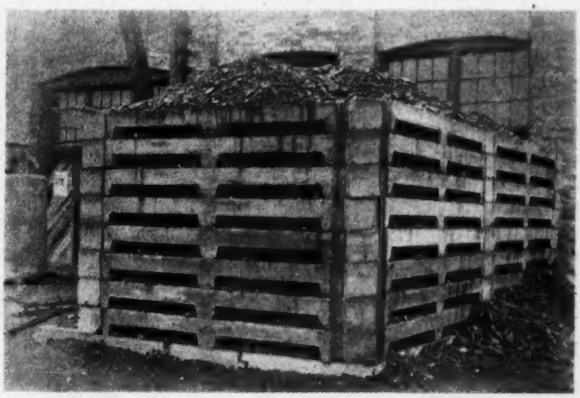


"Hollowspun" Concrete Poles on the Nickel Plate in Cleveland

the contact of the pole and the concrete footings in case it should be desired in the future to change the location of the pole. The poles were furnished by the Massey Concrete Products Corporation, Chicago.

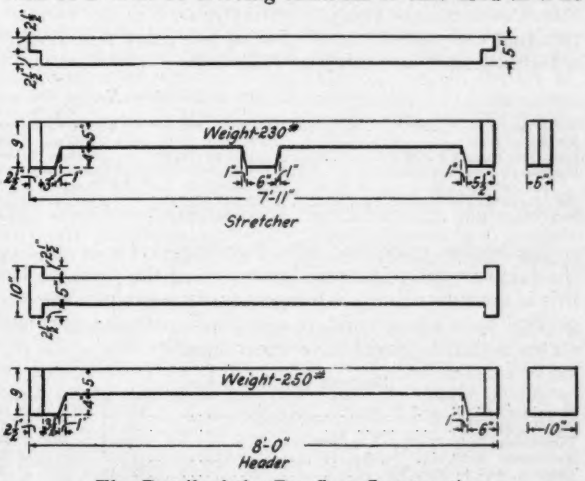
Pre-Cast Concrete for Storing Coal

INGENUITY has come to the front with another idea to interest railway officers in the recent use made of pre-cast concrete for storing a quantity of coal deposited for power plant consumption where no storage bins were



A Carload of Coal Held in Place by Concrete Cribbing

provided. In order to confine the carload of coal received to a minimum space and particularly to prevent the coal from blocking the passageway into the power house and from getting onto the adjacent tracks, as well as to make its disposition as convenient as possible without undue expense, advantage was taken of the presence of a supply of pre-cast concrete sections to make a cribbing bin. The bin is 8 ft. wide, 16 ft. long and 8 ft. high and was built of a form of cribbing identical to that used in a 20



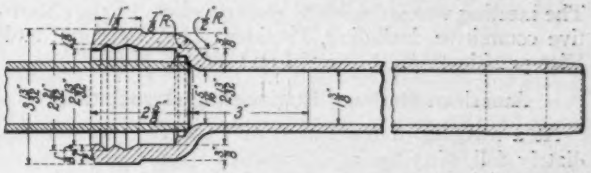
The Detail of the Pre-Cast Construction

ft. retaining wall erected in 1915 and still in service on the Chicago, Rock Island & Pacific at Seventy-ninth street in Chicago.

This cribbing, called interlocked pre-cast reinforced concrete cribbing and a product of the Cement-Gun Construction Company, Chicago, is made in the form of stretchers and headers, which, as the name implies, are so designed as to interlock with each other when in place. In building the crib stretchers were used for the sides and one end of the enclosure, the end of the crib next to the power house having been left open for convenience in securing the coal. These sides were locked together at the middle and at the power house end by headers extended crosswise with the bin and the built-up end was secured in place by extending the headers inwardly from the corners of the bin at an angle of about 45 deg. with the sides, the weight of the coal upon these headers preventing any movement while the bin was filled. Constructed in this fashion the crib is satisfactorily serving the temporary purpose for which it was built.

Cast Iron Pipe in Small Sizes

CAST IRON pipe in sizes as small as 1¼-in. inside diameter is one of the recent developments in water service supplies and affords a solution for the use of small water pipe underground or at other places where wrought iron pipe is subject to severe corrosion. This pipe is manufactured by the McWane Cast Iron Pipe Company, Birmingham, Ala., and is fitted with the usual bell and spigot end, but to overcome the difficulty of pour-



Dimensions of the Small Pipe

ing and calking the small joints, it is equipped with the McWane prepared joint. These prepared joints can be assembled very quickly and made tight with very little calking.

Since the convenient use implies ready connections with wrought pipe, these small cast iron pipes may be obtained with screw ends and to facilitate connecting and disconnecting, all pipes, whether provided with the screw, bell or spigot ends, are formed with an octagonal shape at some point in the length so that they may be turned readily with a wrench. When specified the two-inch size of pipe is equipped at two places in its length with a boss to facilitate tapping for pipe connections up to ¾-in. size. These small diameter pipes are made in five-foot lengths, but to reduce the amount of work required in laying, the manufacturer furnishes a variable proportion of each consignment of the pipe in 10-ft. lengths, formed by joining two five-foot lengths with a joint completely formed and calked. The smallest size of pipe, the 1¼-in., weighs 3¾-lb. per ft., including joints, and, like all the other sizes, is tested to 300-lb. per sq. in. pressure.

Block Signals Expedite Traffic Movement

Roadmasters' Association

At a meeting of the executive committee held in Chicago on March 14, the Sherman hotel was selected as the headquarters for the annual convention, which will be held in Chicago next September. Reports were also received from the various committee chairmen on the work which the committees were doing in the preparation of reports for the coming convention. A. M. Clough urged that particular stress be placed on the study of labor saving devices because of the present labor shortage. The meeting was attended by nine members of the executive committee, including, President J. P. Corcoran and Vice-presidents J. B. Martin and W. F. Muff.

American Railway Engineering Association

At a meeting of the Board of Direction, held immediately following the adjournment of the convention on March 15, W. D. Faucette, chief engineer of the Seaboard Air Line, was elected a director to fill out the unexpired term of C. E. Lindsay, deceased.

The members of the Board of Direction and the chairmen of standing and special committees met at dinner at the Engineers' Club, Chicago, on the evening of March 15, to plan their work and to co-ordinate their activities during the ensuing year. The work of the association was discussed at length and plans made for increased activity on the part of all committees.

Wood Preservers' Association

Approximately forty members of the association and others interested in the preservation of timber spent March 16 at the Forest Products Laboratory, Madison, Wis., observing the work done there and participating in a conference on the problems confronting this industry. After inspecting the laboratory, grading rules for structural timbers and toxicity tests were discussed at length. Following a dinner in the evening there was a general discussion of the Forest Products Laboratory's program of investigation work on wood preservation and allied problems now under way or contemplated in the near future.

Bridge and Building Association

The executive committee met at the Congress hotel, Chicago, on March 13, to receive reports from various standing and special committees. A tentative report of the committee appointed to perfect arrangements for the convention in Seattle next October was approved and the committee was authorized to select a hotel and complete other arrangements. Much interest is being evidenced in this meeting and many members are planning to take advantage of the opportunity to see the western timber in the various steps in its manufacture into finished bridge and building sizes. According to the tentative itinerary which has been prepared those members of the association residing east of Chicago will leave on a special train on Saturday evening, October 6, traveling via Denver, the Denver & Rio Grande Western and the Union Pacific to Portland, with brief stops at Denver, the Royal Gorge and Salt Lake. Two or three days will be spent in the woods and saw mills in the vicinity of Portland and Tacoma and the party will arrive at Seattle on Monday evening, October 15. The convention will open on the following morning.

The Material Market

THE ONLY discordant note in the present material market situation is the question, oft-repeated, as to the duration of the present boom in business. In the meantime there is no question about the tendency—it is still definitely upward. One redeeming feature in the face of the great demand for iron and steel products is the enormous rate of production, which, in the case of steel ingots, is now in the neighborhood of 90 per cent of practical capacity. The production during the month of February was on the basis of an annual output of 43,230,000 tons. As is usual in the case of a seller's market, there is an increase in the spread between the price fixed on the basis of delivery at the manufacturer's convenience and the price for some definite date of delivery. Thus, structural steel in Chicago now ranges from 2.45 to 2.84 cents, whereas the ordinary spread would only be about a tenth of a cent. In the track supply field considerable interest has been shown in the recent order by the New York Central for 13,000 kegs of track spikes, said to have been bought at $2.90.

	Prices in Cents Per Pound							
	February 20				March 25			
	Pittsburgh		Chicago		Pittsburgh		Chicago	
Track spikes	....	2.90	....	3.00	2.40 to	3.15	....	3.15
Track bolts	3.85 to	4.50	3.85 to	4.00	4.00 to	4.50	....	4.15
Angle bars	....	2.75	....	2.75	....	2.75	....	2.75
Tie plates, steel	....	2.45	....	2.45	2.55 to	2.60	....	2.60
Tie plates, iron	....	....	....	2.60	....	....	....	2.75
Plain wire	2.65 to	2.75	2.99 to	3.09	2.65 to	2.75	2.99 to	3.09
Wire nails	2.80 to	3.00	3.14 to	3.34	2.80 to	3.00	3.14 to	3.34
Barbed wire, gal.	3.55 to	3.80	3.89 to	4.14	3.45 to	3.70	3.79 to	4.04
C. I. pipe, 6 in. or larger, per ton	....	....	....	53.20	....	....	....	57.20
Plates	2.10 to	2.25	2.35	....	2.25 to	2.50	2.45 to	2.84
Shapes	2.15 to	2.25	2.35	....	2.25 to	2.50	2.45 to	2.84
Bars, soft steel	2.10 to	2.25	2.35	....	2.25 to	2.50	2.35 to	2.84
Open hearth rail per gross ton f. o. b. mill								$43.00

Scrap continues to rise and is now from $1 to $4 higher than a month ago. It is interesting to note in this connection that the present prices of scrap are more than double what they were in the fall of 1921.

	Prices Per Gross Ton at Chicago	
	February	March
Relaying rails	$32.00 to $35.00	$32.00 to $35.00
Rerolling rails	21.50 to 22.00	25.00 to 25.50
Rails less than 3 ft. long	24.00 to 24.50	26.50 to 27.00
Frogs and switches cut apart	19.75 to 20.00	24.00 to 24.50
	Per Net Ton	
No. 1 railroad wrought	22.50 to 23.00	21.00 to 21.50
Steel angle bars	20.00 to 20.50	23.00 to 23.50

The lumber prices are still advancing slowly in spite of the fact that there is some slowing up of the demand, but this is considered only a temporary situation pending the general opening of building construction in the northern states with the advent of warmer weather.

Southern Pine Mill Prices	February	March
Flooring, 1x4, B. and B. flat	$51.65	$53.35
Boards, 1x8, No. 1	38.15	42.70
Dimension, 2x4, 16, No. 1, common	31.35	31.40
Dimension, 2x10, 16, No. 1	31.35	32.90
Timbers, 4x4 to 8x8, No. 1	29.10	31.25
Timbers, 3x12 to 12x12, No. 1	.....	.....
Douglas Fir Mill Prices		
Flooring, 1x4, No. 2, clear, flat	40.00	44.00
Boards, 1x6, 6 to 20, No. 1, common	17.50	20.50
Dimension, 2x4, 16, No. 1, common	21.50	23.50
Dimension, 2x10, 16, No. 1, common	21.50	23.50
Timbers, 6x6 to 8x8, No. 1, common	18.00	18.00
Timbers, 10x10 to 12x12, rough	22.00	25.00

No change has been quoted in recent weeks in the prices of Portland cement. The following are current prices per barrel for carload lots, not including package:

Chicago	$2.20	Duluth	$2.14
Cincinnati	2.54	Milwaukee	2.37
Davenport	2.43	Minneapolis	2.39
Detroit	2.47	Pittsburgh	2.24

General News

The Chicago Union Station, now under construction, will include a jail, a chapel and a morgue. The jail will be used for holding prisoners passing through Chicago and will eliminate the necessity of an officer being handcuffed to a prisoner while waiting for trains.

T. W. Krein, general manager and receiver of the Muscatine, Burlington & Southern, Muscatine, Iowa, was sent to Leavenworth, Kan., on March 2, to serve a year's sentence in the federal prison for fraudulent overcharges by his road against other carriers for car repairs.

The Chicago, Peoria & St. Louis has received a certificate from the Interstate Commerce Commission authorizing its receivers to abandon as to interstate and foreign commerce its line extending from Pekin, Ill., to East St. Louis, with branches making a total of 234 miles, together with certain trackage rights.

During the year 1922 there was a decline in railway rates and advances in the prices of commodities as the result of which, at the end of the year, the average freight rate was lower compared with the average wholesale price of commodities than it was in 1913, according to statistics just issued by government bodies.

The Great Northern will provide group insurance, life, accident and health, for its 10,000 shopmen, with the Metropolitan Life Insurance Company of New York City. The scheme is similar to group insurance arrangements on other roads, except that the shopmen's brotherhood will deal directly with the insurance company.

The Illinois Central used radio communication recently to get in touch with trains cut off from regular communication during a storm. A message was sent out from two Chicago broadcasting stations requesting listeners to make inquiry of train dispatchers in their vicinity and report. The Hawkeye Limited, stormbound west of Freeport, Ill., for 10 hours, was thus located.

According to a report just issued by the National Industrial Conference Board, 10 East 39th street, New York City, the plans of railroad consolidation that have been proposed to carry out the provisions of the Transportation Act of 1920 may benefit the country's transportation system in many ways, but of themselves cannot be expected to remove the difficulties that face the railroads.

In connection with the order recently issued by the Interstate Commerce Commission authorizing the Southern Pacific to retain control of the Central Pacific, an understanding has been reached between the Southern Pacific and the Western Pacific providing for through routes and joint rates with the Western Pacific and also for joint use of the tracks of the two companies in Nevada, as double track.

The Texas legislature has approved a bill authorizing the consolidation of the Trinity & Sabine and the Beaumont & Great Northern railways which were recently purchased from the receiver of the Missouri, Kansas & Texas Railway by Colonel R. C. Duff of Houston, Tex. Mr. Duff will extend the merged short lines to form a direct route from Waco, Tex., to the Gulf. The contemplated improvements will cost $4,000,000.

During the year ending June 30, 1922, the Class I railways reporting to the Presidents' Conference Committee on Valuation expended $8,750,930 on valuation work, bringing the total expended by these roads for the nine years ending on that date to $62,884,742. The expenditures of the Bureau of Valuation for the same year were $1,595,488 and the total expenditures by the bureau from the beginning of its work to June 30, 1922, have been $23,058,298.

In the week ended February 11, the total number of cars loaded with freight was 853,289, while in the week ended March 4, in spite of bad weather, it was 917,896. This was the largest number of cars ever loaded with freight in any week of any year before June. In the first nine weeks of the present year the number of cars loaded with freight was 7,665,157. This was an increase of 15 per cent over 1922, and 6½ per cent over 1920, the previous record year.

The Bureau of Railway Economics, in a bulletin just issued estimates the number of freight stations in the United States as 78,045. The count shows 39,029 stations with agents, and 45,934 without agents, or a total of 84,963, from which 6,918 are deducted as representing duplication due to joint use of statons. The deduction is estimated on the basis of the percentage of stations jointly used on the lines of 34 roads from which special returns were secured. The bulletin gives the number by states.

In a recent decision of three federal judges sitting as a special court at New Orleans on March 17, denying and dismissing the petition by the Dayton-Goose Creek Railway for a preliminary injunction to stay and suspend for order of the Interstate Commerce Commission calling for the payment to it of one-half of the company's excess earnings above six per cent for 1920 and 1921 and the payment of the other half into reserve fund, the so-called "recapture" provisions of the Transportation Act of 1920 were held constitutional.

The total number of ties inserted in the tracks of the Northern Pacific from 1911 to 1915, inclusive, was 13,520,613, an average of 2,704,123 per year. During the period from 1916 to 1920 12,073,283 ties were inserted, an annual average of 2,414,796, a decrease of 289,326. The Northern Pacific established its treating plants at Brainerd, Minn., and Paradise, Mont., in 1907. The average life of the better grades and species of timber used for ties prior to the establishing of these plants was six to eight years, so that the second period shows the beginning of the effect of the use of treated ties. Before treating plants were built only the best grades and species of timber were used, but since treatment has been undertaken inferior species of timber, such as birch, ash, elm, maple, red oak, cottonwood and jack pine are used with excellent results.

A new plan of organization for the railway units of the six field army reserves now being organized by the War Department has recently been authorized by Adjutant-General H. H. Tibbetts, which provides for the creation of 36 railway engineer battalions, each to be formed from among the officers and employees of a railway system and each to be designated by the name of the railway. Each battalion will consist of a headquarters platoon and three companies, one for operation, one for maintenance of equipment and one for maintenance of way. In the event of war or a national internal emergency (declared by Congress) they will perform much the same service as that of the railway regiments which were organized after the United States entered the war with Germany. The general idea of the plan was suggested to the War Department by Lieutenant-Colonial W. G. Arn, assistant chief engineer, Chicago terminal improvement, Illinois Central, who served in France during the war with the Thirteenth Engineers.

Personal Mention

General

L. W. Baldwin, vice-president in charge of operation of the Illinois Central, with headquarters at Chicago, and an engineer by education and experience, has been elected president of the Missouri Pacific, with headquarters at St. Louis, Mo., succeeding **B. F. Bush** also an engineer, who has been elected chairman of the boardof directors. A sketch of Mr. was published in *Railway Engineering and Maintenance* for February, 1923, page 51.

R. C. Watkins, an engineer by training and experience, has been appointed vice-president and general manager of the Louisiana Lines of the Southern Pacific, with headquarters at New Orleans, La. Mr. Watkins, who is a graduate in civil engineering, entered the employ of the Southern Pacific in 1895, serving in various technical positions on the El Paso division. In 1898 he became assistant engineer of construction on new work on the Louisiana Lines and in 1902 was promoted to engineer of the Houston division, which position he held to 1904, when he was appointed office engineer in the general offices at Houston. Subsequently, he was appointed right-of-way agent and in 1913 became superintendent of the Houston dvision. During the period of Federal control Mr. Watkins served as corporate engineer and for the past three years has been engaged in supervising the adjustment of claims against the government for the entire system.

J. T. Loree, general manager of the Delaware & Hudson, with headquarters at Albany, N. Y., and an engineer by experience, has been promoted to vice-president and general manager in charge of the operating and traffic departments, with the same headquarters. Mr. Loree was born on April 6, 1888, at Logansport, Ind., and was graduated from Yale University in 1909. He entered railway service as chief traveling auditor of the Kansas City Southern in the same year and from May to September, 1910, served in the signal department of the Pennsylvania. From the latter date to February, 1911, he held various positions in the engineering department of the Southern Pacific and in June of the same year became a draftsman on the Delaware & Hudson. He was sent on a special mission to study English railroad practice a few months later, upon the completion of which he became assistant division engineer of the Southern Pacific. He served in that capacity until 1912, when he reentered the employ of the Pennsylvania as a trainmaster's clerk and assistant trainmaster. In July, 1913, he was appointed assistant trainmaster in charge of the Carbondale, Pa., terminal of the Delaware & Hudson and in February, 1914, was promoted to trainmaster on the Susquehanna division and in June of the same year to superintendent of that division, since which he has served successively as assistant to the superintendent of transportation and as general manager, until his recent promotion, except during the war, when he was engaged in military service, where he was provost-marshal, deputy general at the time of his discharge.

J. T. Loree

M. W. Clements, general superintendent of the Lake division of the Central region of the Pennsylvania System, with headquarters at Cleveland, Ohio, and an engineer by experience, has been promoted to general manager of the Central region, with headquarters at Pittsburgh, Pa. Mr. Clements was born at Sunbury, Pa., on December 5, 1881, and was educated at Trinity College. He entered railway service in 1901 in the engineering department of the Pennsylvania and in March, 1905, was promoted to assistant supervisor and later to supervisor. In December, 1914, he was promoted to division engineer and from June, 1917, to September of the following year, served as division superintendent, being promoted to superintendent of freight transportation on the latter date. In June, 1919, he became superintendent of passenger transportation and in March, 1920, was promoted to general superintendent, with headquarters at Cleveland, the position he held at the time of his recent promotion.

Thomas Kilpatrick, government superintendent of highway bridges of British Columbia, has been promoted to general manager of the Pacific Great Eastern, with headquarters at Vancouver, B. C. Mr. Kilpatrick was born on April 27, 1867, at Simcoe, Ont., and entered railway service in May, 1884, in the engineering department of the Canadian Pacific on construction work on the North Shore of Lake Superior. In June, 1885, he was transferred to the Naughton section in British Columbia, where he became a bridge carpenter in April, 1886. He was promoted to bridge foreman in April, 1887, and served in this capacity until August, 1893, when he was promoted to bridge and building master of the same district. He was promoted to superintendent of district No. 1, British Columbia division, with headquarters at Revelstoke, B. C., in May, 1901, and held this position until December, 1912, when he left railway service to engage in private business. In August, 1915, he was appointed inspector and superintendent of highway bridges for the government of the Province of British Columbia, in which position he was serving on February 1, 1923, when he was promoted to general manager of the Pacific Great Eastern.

H. E. Newcomet, superintendent of the Cleveland and Pittsburgh division of the Central region of the Pennsylvania System, with headquarters at Cleveland, Ohio, and an engineer by experience, has been promoted to general superintendent of the Lake division, with the same headquarters. Mr. Newcomet was born at Philadelphia, Pa., on April 27, 1874, and was graduated from the University of Pennsylvania in 1894. He entered railway service in February, 1896, as an engineering assistant on the Chicago division and in 1897 was appointed acting assistant engineer on the Cleveland and Pittsburgh division. From 1898 to June, 1901, he was assistant engineer maintenance of way of the Cincinnati division, and on the latter date was promoted to engineer maintenance of way of the Indianapolis and Vincennes division. He was transferred to the Cincinnati division on January 15, 1903, and in March, 1905, was transferred to the Erie and Ashtabula division. In 1906 he was appointed division engineer of the Cleveland and Pittsburgh division and in January, 1913, became superintendent of the Louisville division, the position he held at various points up to the time of his recent promotion.

Engineering

B. S. Walker has been appointed assistant engineer on the Pere Marquette with charge of second track work between Michigan avenue, Detroit, and Plymouth.

H. Rindal, district engineer of the British Columbia district of the Canadian Pacific, with headquarters at Vancouver, B. C., has been transferred to the Alberta district, with headquarters at Calgary, Alta.

E. H. McGovern, resident engineer of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters in Cincinnati, Ohio, has been promoted to office engineer, with the same headquarters, succeeding **F. H. Plaisted,** resigned. Mr. McGovern will be succeeded by **B. E. Delameter.**

A. W. Duke, supervisor on the Pennsylvania, with headquarters at North Philadelphia, Pa., has been promoted to division engineer of the Logansport division, with headquarters at Logansport, Ind., succeeding **G. R. Barry,** promoted to superintendent of the Richmond division.

H. C. Johnson, division engineer of the South Bend division of the Southwestern region of the Pennsylvania System, with headquarters at Logansport, Ind., has been transferred to the Cincinnati division, with headquarters at Cincinnati, Ohio,

in place of **F. N. Crowell,** who has been transferred to the South Bend division. **A. S. Bland,** division engineer of the Peoria division, with headquarters at Decatur, Ill., has been appointed assistant engineer in the office of the chief engineer maintenance of way of the Southwestern region, with headquarters at St. Louis, Mo.

R. G. Aylsworth, resident engineer of the Chicago, Burlington & Quincy, with headquarters at Denver, Colo., has been promoted to district engineer maintenance of way of the Wyoming district, with headquarters at Alliance, Neb. Mr. Aylsworth was born on June 9, 1879, at Angola, Ind., and was graduated from Cotner University in 1896. During 1906 and 1907 he also studied at Yale University. He entered railway service in May, 1899, as an axman on construction on the Chicago, Burlington & Quincy and was promoted to assistant division engineer in the same year. He was promoted to division engineer in 1903 and from 1906 to 1909 served intermittently as division engineer and inspector. In 1909 he was appointed resident engineer, with headquarters at Denver, Colo., the position he held at the time of his recent promotion.

H. H. Richardson, whose appointment as engineer of water service of the Missouri Pacific, with headquarters at St. Louis, Mo., was reported in the February issue, was born on July 23, 1897, at Savonburg, Kan., and received his education at the Kansas University, Lawrence, Kan., where he was graduated as a chemist. He entered railway service in May, 1918, as a chemist in charge of water softening on the Eastern and Southern districts of the Missouri Pacific, with headquarters at Little Rock, Ark., where he remained until July, 1922, when he left the Missouri Pacific to become assistant sanitary engineer of the St. Louis Southwestern, with headquarters at Pine Bluff, Ark. While at Pine Bluff, Mr. Richardson was engaged particularly with the conduct of a water survey and the solution of a water supply problem then confronting the company. Mr. Richardson continued in this capacity on the St. Louis Southwestern until January, 1923, when he returned to the Missouri Pacific upon his appointment as engineer of water service, to succeed R. C. Bardwell upon the latter's appointment to a similar position on the Chesapeake & Ohio.

H. H. Richardson

Canadian National Reorganization

C. S. Gzowski, assistant to the vice-president in charge of construction of the Canadian National, has been appointed chief engineer of the construction department, with headquarters at Montreal, Que. **C. B. Brown,** engineering assistant to the vice-president of the Canadian National, with headquarters at Toronto, Ont., has been appointed chief engineer of the operating department, with headquarters at Montreal, Que. **F. L. Bond,** chief engineer, Grand Trunk lines east of the Detroit and St. Clair rivers, has been appointed chief engineer of the Central region, with headquarters at Toronto, Ont., and **H. T. Hazen,** acting chief engineer of the Central region, has been appointed assistant chief engineer, with the same headquarters. **H. B. Stuart,** structural engineer of the Grand Trunk, with headquarters at Montreal, Que., has been appointed bridge engineer of the Central region of the Canadian National, with headquarters at Toronto, Ont., and **C. P. Disney,** bridge engineer of the Canadian National, has been appointed assistant bridge engineer. **A. Crumpton,** valuation engineer of the Grand Trunk, with headquarters at Montreal, Que., has been appointed valuation engineer of the Canadian National. These appointments have been made incident to the taking over of the Grand Trunk by the Canadian National and the consolidation of official staffs.

Mr. Brown was born on August 27, 1879, at Ithaca, N. Y., and was graduated from Cornell University in 1901. He entered railway service in the same year as a draftsman on the Canadian Pacific and served successively as a rodman and an assistant engineer in the bridge department until 1902 when he became resident engineer on the Ontario division. From 1904 to 1906, he was assistant divison engineer at Calgary, Alta., and thereafter was division engineer at St. John, N. B., and later at Montreal until 1912 when he was promoted to principal assistant engineer of the Eastern lines. From 1913 to 1917 he was chief engineer of the Canadian Government Railways at Moncton, N. B., and in 1917 was promoted to assistant general manager of the Eastern lines and chief engineer, system. In 1918, he was appointed chief engineer of the Canadian National Eastern Lines. which included what was formerly known as the Canadian Government Railways, and in 1920 was advanced to engineering assistant to the vice-president, which position he held at the time of his recent appointment.

C. B. Brown

Mr. Bond was born on February, 21, 1887, at Montreal, Que., and graduated from McGill University with the degree of bachelor of science in 1898. He entered railway service in 1897 with the Canadian Pacific on the construction of a line near Ottawa, Ont., a short time thereafter entering the service of the Grand Trunk as assistant engineer. In 1902 he was engaged in subway construction in New York and the following year was appointed resident engineer of the eastern division of the Grand Trunk, in which capacity he served until 1913 when he was promoted to division engineer. In 1917 and 1918 he served with the Canadian forces in France as a major of railway engineers and from December, 1918, until the time of the consolidation of the Grand Trunk with the Canadian National, he served the former company as chief engineer.

F. L. C. Bond

L. Yager, whose appointment to the position of assistant chief engineer of the Northern Pacific, with headquarters at St. Paul, Minn., was reported in the February issue, was born on July 12, 1877, at Germantown, Wis., and graduated from the University of Minnesota in 1900. He entered railway service in June of that year as a rodman and inspector on the Northern Pacific at Brainerd, Minn., and in April, 1901, was promoted to assistant engneer in charge of bridge construction between Fargo, N. D., and Billings, Mont. In March, 1902, he was promoted to supervisor of bridges and buildings, with headquarters at Minneapolis, Minn., and in February, 1907, was promoted to assistant engineer on the reconstruction of the St. Louis Bay drawbridge between Duluth,

Minn., and Superior. In May, 1909, he was appointed assistant engineer of construction of the line from Glendive to Sidney, Mont., and in March, 1910, was promoted to division engineer at St. Paul, Minn. From January, 1917, to July, 1919, he was engineer maintenance of way, Lines east of Paradise, Mont., and from the latter date to April, 1920, served as chief maintenance of way engneer of the United States Railroad Administration, Washington, D. C., returning to the Northern Pacific on the latter date as engineer maintenance of way, with headquarters at St. Paul, in which capacity he was serving at the time of his recent appointment.

H. T. Livingston, division engineer of the Des Moines Valley division of the Chicago, Rock Island & Pacific, with headquarters at Des Moines, Ia., has been transferred to the Arkansas division, with headquarters at Little Rock, Ark., succeeding **F. C. Funda,** who has been acting division engineer. **W. E. Heimerdinger,** assistant engineer, with headquarters at Estherville, Ia., has been promoted to division engineer, with headquarters at Des Moines, Ia., succeeding Mr. Livingston. **R. C. Baird,** assistant engineer, with headquarters at Chicago, has been transferred to Estherville, Ia., succeeding Mr. Heimerdinger.

E. B. Fithian, whose promotion to district engineer of the Missouri Pacific, with headquarters at Kansas City, Mo., was reported in the February issue, was born on February 4, 1872, at Greenwich, N. J. He graduated from Rutgers College in 1896 and entered the service of the Pennsylvania on September 1 of that year in the engineering department of the New York division. He was promoted to assistant to the division engineer in September, 1899, and to office engineer, with headquarters at Altoona, Pa., in January, 1900. He was promoted to assistant supervisor in April, 1900, and served in this capacity until August, 1903, when he entered the service of the Baltimore & Ohio, as maintenance of way inspector. He was promoted to assistant division engineer on January 1, 1904, and to division engineer in January, 1906. He entered the service of the Missouri Pacific in October, 1908, as division engineer of the Central division and was later transferred successively to the Arkansas and the Missouri divisions where he was located at the time of his recent promotion.

Track

H. Du Bois, foreman in the Montreal terminals of the Canadian Pacific, has been promoted to roadmaster, with headquarters at Three Rivers, Que. Mr. Du Bois was born at St. Clet, Que., on April 28, 1891, and entered railway service with the Canadian Pacific as a laborer, being promoted to foreman on February 19, 1914, and later transferred to the Montreal terminals, the position he held at the time of his recent promotion.

S. Jenson has been appointed roadmaster on the First district of the Cascade division of the Great Northern, with headquarters at Tye, Wash., succeeding **H. F. Sheldon,** transferred to the Second district of the Cascade division, with headquarters at Everett, Wash., in place of **C. Holm,** resigned. **H. M. Petry** has been appointed roadmaster on the First district of the Kalispell division, with headquarters at Essex, Mont., succeeding **J. Sullivan, Jr.,** resigned. **R. Hughes, roadmaster,** with headquarters at Blain, Wash., has had his headquarters transferred to Bellingham, Wash.

Robert Drake Brown, whose promotion to roadmaster of the First district of the Arizona division of the Coast Lines of the Atchison, Topeka & Santa Fe, with headquarters at Kingman, Ariz., was noted in the February issue, was born at Hartford, Conn., on November 22, 1876, and received his education at Yale University. He entered railway service in 1901 in the engineering department of the Atchison, Topeka & Santa Fe and has since been in the continuous service of that road as bridge inspector, transitman and assistant division engineer, with the exception of the period from 1912 to 1916, when he was engaged in private engineering practice.

R. Sands, roadmaster of the Fourth subdivision of the Salt Lake division of the Los Angeles & Salt Lake, with headquarters at Caliente, Nev., has been transferred to the Second district, with headquarters at Kelso, Cal., in place of **C. D. Olson,** resigned. **E. A. Buskirk** has been permanently appointed roadmaster of the Fifth subdivision, with headquarters at Milford, Utah, succeeding **D. Ralston,** resigned. **J. C. Thiessen** has been appointed roadmaster, with headquarters at Las Vegas, Nev., in place of **C. G. Hitt,** transferred to the Los Angeles division, with headquarters at Los Angeles, Cal., succeeding **William Crowley,** retired.

C. E. Stonehocker has been appointed roadmaster of the Fourth subdivision of the Salt Lake division of the Los Angeles & Salt Lake, with headquarters at Caliente, Nev., succeeding **R. Sands,** who has been transferred, as noted elsewhere in these columns. Mr. Stonehocker was born at Barnard, Mo., on February 1, 1876, and entered railway service in 1891 as a water boy on the Atchison, Topeka & Santa Fe, later serving as section laborer at Fountain, Colo. On April 1, 1901, he became a section laborer on the Union Pacific at Sidney, Neb., and was promoted to section foreman on the Third district in September, 1901, since which he has been in the continuous service of the Union Pacific in the track and signal departments until his appointment as noted above.

L. N. McClelland, general foreman on the Southwestern region of the Pennsylvania System, has been promoted to acting supervisor on the Louisville division, with headquarters at Louisville, Ky., in place of **J. A. Garrettson,** who has been granted a leave of absence on account of illness. **J. W. Kildow,** supervisor on the Cincinnati division, with headquarters at Cincinnati, Ohio, has resigned. **Ira Puterbaugh,** track foreman on the Cincinnati division, has been promoted to supervisor of subdivision No. 4 of the Cincinnati division, with headquarters at Xenia, Ohio, in place of **A. J. Canney,** who has been transferred to subdivision No. 1 of the same division, with the same headquarters, succeeding **J. J. Guilday,** who has been transferred to subdivision No. 5 of the same division. **S. E. Oglesby,** supervisor on the Fort Wayne division, has been transferred to the South Bend division.

Lee Barnes, roadmaster of the Rocky Mountain division of the Northern Pacific, with headquarters at Missoula, Mont., has been promoted to general roadmaster, with headquarters at Pasco, Wash. Mr. Barnes was born at Horton, Mich., on September 25, 1884, and entered railway service in June, 1903, as a rodman on the Northwest division of the Chicago Great Western. In February, 1904, he subsequently served as draftsman, assistant engineer and nspector in the engineering department until March 1, 1907, when he became section foreman. Returning to the Chicago Great Western on September 1, 1907, he served as extra gang and section foreman in the yards at Dubuque, Iowa, until December 1, 1910, when he became section foreman in the Minneapolis yards of the Northern Pacific. In May, 1911, he was promoted to extra gang foreman on ballasting and steel relaying work, and on July 1, 1913, he was promoted to assistant roadmaster of the St. Paul division,. He was promoted to roadmaster of the Rocky Mountain division on March 28, 1916, the position he held at the time of his recent promotion.

Lee Barnes

Harry Lee Hoskins, whose promotion to roadmaster of the Third district of the Arizona division of the Coast Lines of the Atchison, Topeka & Santa Fe, with headquarters at Parker, Ariz., was noted in last month's issue, was born at New Lyme, Ashtabula County, Ohio, on July 24, 1883, and graduated from New Lyme Institute in 1902. He entered railway service on July 22, 1907, as timekeeper on the Atchison, Topeka & Santa Fe, subsequently being promoted to assistant foreman and general extra gang foreman. From October 29, 1913, to February 18, 1918, he served as roadmaster's clerk, on the latter date being promoted to acting roadmaster, with

headquarters at Ludlow, Cal., which position he held until August 1, 1918, when he again became roadmaster's clerk. On May 9, 1922, he was promoted to acting roadmaster of the Third district of the Arizona division, where he was located at the time of his promotion.

R. O. Dougherty, whose promotion to supervisor of track on the Minneapolis & St. Louis, with headquarters at Conde, S. D., was noted in last month's issue, was born at Fairview, Ill., on August 13, 1887, and took the International Correspondence School course in civil engineering. He entered railway service on July 1, 1901, as a section laborer on the Chicago, Burlington & Quincy, and was promoted to assistant extra gang foreman on April 1, 1903, which position he held until April 1, 1907, when he was promoted to section foreman at Yates City, Ill. On June 1, 1909, he was transferred to the yards at Canton, Ill., and on May 15, 1910, left this road to go with the Chicago & North Western at Akron, Ill., where he served successively as extra gang and section foreman until April 1, 1912, when he become a section foreman on the Minneapolis & St. Louis at Seaton, Ill. He was transferred to Elrick Junction, Iowa, on November 16, 1916, and from that date served as extra gang and section foreman at various points until February 1, 1923, when he was promoted to supervisor of track, with headquarters at Conde, S. D., as noted above.

Bridge and Building

J. C. Bland, engineer of bridges and buildings of the Pennsylvania system, with headquarters at Pittsburgh, Pa., has retired from active service, Mr. Bland was born on January 22, 1853, at Philadelphia, Pa., and entered railway service in 1872 as a rodman on the Pennsylvania Railroad. He was promoted to assistant engineer in 1873 and on May 1, 1895, after an extended absence, he returned to railway service as an employee in the chief engineer's office of the Pittsburgh, Cincinnati, Chicago & St. Louis. On January 16, 1896, he was promoted to assistant engineer and on January 1, 1901, was promoted to engineer of bridges of the Lines west of Pittsburgh.

Purchases and Stores

W. A. Hopkins, supply agent of the Missouri Pacific, with headquarters at St. Louis, has been promoted to general purchasing agent, with the same headquarters, succeeding **C. A. How,** deceased, as noted elsewhere in these columns.

Obituary

John Hair, formerly special engineer of the Baltimore & Ohio, with headquarters at Baltimore, Md., died on March 5 at Pittsburgh, Pa.

D. U. Milligan, supervisor on the South Bend division of the Southwestern region of the Pennsylvania System, with headquarters at Frankfort, Ind., died recently.

C. A. How, general purchasing agent of the Missouri Pacific, with headquarters at St. Louis, died on March 5, at St. Louis, Mo. Mr. How was born in 1866 at Brooklyn, N. Y., and entered railway service in 1884 as a file clerk for the Union Pacific at Council Bluffs, Iowa. In 1885, he entered the employ of the Chicago, Burlington & Quincy, at Omaha, Neb., as a clerk, being transferred a few years later to Plattsmouth, Neb., where he was promoted to chief clerk to the supply agent. He was promoted to supply agent in charge of the Hannibal and St. Joseph divisions in 1899 and was promoted to division superintendent in 1904. Subsequently, he was in the employ of a railway supply company for one year and in 1905 was appointed purchasing agent of the Wabash, with headquarters at St. Louis, Mo. He was appointed supply agent of the Missouri Pacific, with the same headquarters in 1910, and 1911 was promoted to general purchasing agent. During Federal control he served as chairman of the Regional Purchasing Committee, returning to his position as general purchasing agent of the Missouri Pacific at the expiration of Federal control, which position he held at the time of his death.

Construction News

The Atchison, Topeka & Santa Fe will construct a tie treating plant at National City, Cal., to cost approximately $250,000, additonal storage tracks at Los Angeles, Cal., to cost $115,000, and a water treating plant at Hot Springs Junction, Ariz. This company will construct a line from El Segundo, Cal., to Wilmington, a distance of approximately 20 miles. Contracts for the grading and for the construction of bridges will be let about April 1. Six small bridges and two station buildings will be included. This company will construct second track from Bakersfield, Cal., to Kern Junction, and will construct third main track from Emporia, Kan., to Plymouth. This company contemplates the construction of a new passenger station at Cushing, Okla., and will construct extensions to the shop facilities at San Bernardino, Cal., at an approximate cost of $1,250,000. A portion of the work to cost $750,000 will be undertaken this year. Plans include also the rearrangement of the machine, boiler and paint shops and the installing of a 120-ft. turntable.

This company will construct 10 story, 75 ft. by 50 ft. reinforced concrete additions to its office building at Topeka, Kansas.

The Baltimore & Ohio, which was reported in the March issue as calling for bids for the construction of a water treating plant of 25,000 gal. per hour capacity and for alterations to the existing pipe lines at Ivorydale, Ohio, has awarded a contract for the work to Joseph E. Nelson & Sons, Chicago.

The Baltimore & Ohio has placed a contract with the Pittsburgh Construction Company covering the erection of three deck plate girder spans at Proctor, W. Va. The new spans vary in length from 40 to 103 ft. and with the total weight of steel approximately 160 tons.

The Belt Railroad of Indianapolis will elevate tracks through that city according to an arrangement whereby the city and county will pay 50 per cent of the cost of the work.

The Buffalo, Rochester & Pittsburgh has awarded a contract to the American Bridge Company for strengthening 17 steel bridges between Punxsutawney, Pa., and Echo, to permit the operation of heavier power. This company has awarded a contract to the Miller Construction Company, Lock Haven, Pa., for the grading necessary for a 2-mile extension to its Jacksonville branch.

The Canadian National has authorized the resumption of the branch line construction from Kamloops, B. C., to Kelowna, discontinued during the war.

The Central of Georgia has awarded a contract to the Ogle Construction Company, Chicago, for the erection at Macon, Ga., of a reinforced concrete electrically operated coaling station which will provide for the ground and overhead storage of 9,000 tons and 600 tons of coal, respectively, and the storage of 200 tons of wet sand and 35 tons of dry sand.

The Chesapeake & Ohio called for bids during the month for the construction at Pikeville, Ky., of an 89-ft. by 27-ft. brick passenger station, with a 25-ft. by 55-ft. baggage and express building, a butterfly shed 310-ft. long and a concrete platform 400 ft. long.

This company has applied to the Interstate Commerce Commission for authority to extend a branch line 0.6 miles up the Gauley river, from Bryce, W. Va.

This company has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of an addition to the store house at Huntington, W. Va., to cost approximately $80,000.

The Chicago & North Western has awarded a contract to the Graver Corporation, East Chicago, Ind., for the construction of a water softener with a capacity of 6,000 gal. per hour at Montfort Junction, Wis. This company contemplates the construction of a roundhouse and machine shop at Watersmeet, Mich., to cost approximately $35,000, and the construction at Blair, Neb., of a new bridge across the Missouri river.

This company has been ordered by the Railroad Commission of Wisconsin to construct a union passenger station at La Crosse, Wis., jointly with the Chicago, Burlington &

Quincy, the Chicago, Milwaukee & St. Paul and the La Crosse & Southeastern.

The Chicago, Burlington & Quincy has awarded a contract to the Blome-Sinek Company, Chicago, for the construction of caisson foundations for a new outbound freight house and viaduct to be constructed at Canal and Polk streets, Chicago, as reported in the March issue.

This company is receiving bids for a five-stall addition to its roundhouse at Eola, Ill., and a seven-stall addition to its roundhouse at Aurora, Ill., and contemplates the construction of new passenger stations at Lathrop, Mo., and Carthage.

This company also contemplates the construction of a 60-mile line from Sheridan, Wyo., northward into the coal fields of Southeastern Montana, and low grade freight cut off 16 miles long from Frederick, Ill., to Vermont.

The Chicago, Rock Island & Pacific has awarded a contract to the J. A. Benson Construction Company, Des Moines, Iowa, for the construction of a 13-stall roundhouse at Valley Junction, Iowa, and is calling for bids for the reconstruction of its passenger station at Valley Junction, Iowa.

This company has awarded a contract to the Railroad Water & Coal Handling Company for the construction of oil stations at El Dorado, Ark., Haskell, Tinsman and Malvern, to cost $15,000 each, and a contract to Joseph E. Nelson & Sons, Chicago, for oil stations at Little Rock, Ark., Boneville, Ala., and Mesa.

The Chicago, St. Paul, Minneapolis & Omaha has been ordered by the Railroad and Warehouse Commission of the State of Minnesota to construct a subway under its tracks at Medelia, Minn.

The Chicago Union Station Company has awarded a contract for the foundation of the Metropolitan elevated structure, Chicago, to the Underground Construction Company.

The Cleveland, Cincinnati, Chicago & St. Louis contemplates the construction of new yard facilities at Terre Haute, Ind.

The Columbus, Mineral Range & Southern, which was recently organized at Columbus, Mont., with F. M. Post as chief engineer, will construct 80 miles of track from Columbus along the Stillwater river in a southwesterly direction, into a new mining district. Contract for grading will be let about May 1 and for track laying, about June 1. One bridge 500 ft. long and seven bridges from 60 to 80 ft. long will be included in the work. Terminal facilities and office buildings will be constructed at Columbus, as well as other necessary structures along the right-of-way. Rolling stock and motive power will be purchased in July and August, according to the plans of the company.

The Delaware & Hudson is negotiating with the city of Scranton, Pa., on a proposal to eliminate a number of highway grade crossings at that point.

The Elgin, Joilet & Eastern is receiving bids for a 20-stall roundhouse at Gary, Ind.

The El Paso & Southwestern plans the construction of a 10-stall addition to the roundhouse and the enlargement of its coach shop at El Paso, Texas.

The Erie is contemplating extensive repairs to its passenger station at Jersey City, N. J. The work includes raising the level and paving the floor of the station and platforms and the installation of new platform gates and train indicators.

The Fort Wayne Union Railway has applied to the Interstate Commerce Commission for permission to construct at Fort Wayne, Ind., a belt line to connect with the New York, Chicago & St. Louis, the Wabash, the New York Central and the Pennsylvania.

The Galveston, Harrisburg & San Antonio has awarded a contract to V. E. Ware, El Paso, Texas, for the construction of a locomotive erecting shop at El Paso. The structure will be 258 ft. long by 84 ft. wide with a height of 60 ft. and will cost $200,000, including cranes, pits, tracks and drainage. It will be of structural steel frame, brick walls, steel sash and concrete floors and equipped with one 200-ton and one 15-ton traveling crane.

The Great Northern contemplates the construction of a reinforced concrete and steel ore dock at Superior, Wis., to cost approximately $1,500,000, which will replace one of the present timber docks.

The Illinois Central has awarded a contract to the Smith & Mitchell Construction Company, Kansas City, Mo., for the reduction of grades at Paxton, Ill., as reported in the February issue, and has also awarded contracts to the Walsh Construction Company, Chicago, for grade reduction at Magnet, Ill., and to M. L. Windom, Centralia, Ill., for grade reduction at Alma, Ill., also reported in the February issue. This company has awarded a contract to A. Ward, Chicago, for the grading in preparation for the construction of additional main tracks at Matteson, Ill.

This company has awarded a contract to W. H. Bradlin, Fulton, Ky., for alterations to the passenger station at Morganfield, Ky., as noted in the March issue, and will construct a 30 ft. extension to the frame passenger stations at Hazelhurst, Miss., and Sturgis, Ky. This road will construct two brick bunkhouses at Dunlap, Iowa, has closed bids for the construction of a freight and passenger station at Beaver Dam, Ky., and contemplates the construction of a brick and steel car repair shop and other additions to the shop facilities of the Burnside shops at Chicago, to cost approximately $3,000,000.

This company has asked for bids for the construction of a retaining wall between 28th and 41st streets, Chicago, for retaining walls north of Roosevelt road, and excavation and miscellaneous work south of Randolph street and for the protection of a large sewer at 39th street.

This company will construct a one-story brick passenger station at Anna, Ill., and closed bids on March 2 for the construction of a brick suburban passenger station at 79th street, Chicago, as reported in the March issue.

The Kansas City Southern contemplates the construction of an addition to the grain elevator at Port Arthur, Texas, which will increase its capacity by 60,000 bushels, and closed bids March 14 for the construction of a one-story brick passenger station, 186 ft. by 24 ft., at De Quincy, La.

The Long Island is preparing plans for a new station at Bayside, Long Island.

The Long Island has commenced work on its grade crossing elimination project between Jamaica, L. I., and Floral Park. The work will include the elimination of eight grade crossings and the addition of two running tracks, making a four-track line. The work will cost approximately $2,500,000. The company has also undertaken grade crossing elimination work at Richmond Hill on its Montauk division to cost approximately 750,000.

The Missouri, Kansas & Texas has awarded a contract to the Graver Corporation, Chicago, for the construction of 24 water treating plants along its lines, as reported in the March issue. A plant of 30,000 gal. per hour capacity will be installed at Bellmead, Texas, and a 20,000 gal. capacity plant with a 100,000 gal. capacity storage tank will be constructed at Muskogee, Okla. Two plants of 15,000 gal. capacity each will be constructed at Vinita, Okla., and Hillsboro, Texas, the latter also having storage tank of 100,000 gal. capacity. A 12,000 gal. capacity station will be constructed at San Antonio, Texas, and 10,000 gal. capacity stations will be constructed at Warne, Okla., and Temple, Texas. Plants of 8,000 gal. capacity will be constructed at McBaine, Mo., Armstrong, Okla., and Altus. Stations of 5,000 gal. capacity will be constructed at Marthasville, Mo.; Pryor, Okla.; Frederick, Okla.; Leedey, Okla.; Woodward, Okla.; Neosho Falls, Kans.; Chanute, Kans.; Georgetown, Texas; Pershing, Texas; San Marcos, Texas; New Braunfels, Texas; Lockhart, Texas; Clear Fork, Texas, and Stamford, Texas.

This company contemplates the construction of a car repair shop and an addition to the freight station at Tulsa, Okla., and closed bids on March 10 for a four-story ice house and plant at Denison, Texas, the building to be 40 ft. by 40 ft. with a platform 800 ft. by 16 ft. This road will construct an addition to its freight depot at Kansas City, Mo., to cost approximately $200,000, work to start in 90 days.

The Missouri Pacific has awarded a contract to the Massman Construction Company, Kansas City, Mo., for the construction of a 1,000 ft. revetment on the Missouri river near Levasy, Mo., and a rock toe wall and bank paving along the Big Blue river at Dodson, Mo.

This company has awarded a contract to the Folwell-Ahlskog Company, Chicago, for the construction of 2,000,000 bu. reinforced concrete grain elevator at St. Louis, Mo.;

contemplates the construction of a supply building at Chouteau avenue, St. Louis, Mo., to cost approximately $100,000, and will soon call for bids for the construction of six water treating plants along the line between El Dorado, Ark., and Gurden. The cost of this latter construction is expected to be approximately $50,000.

This road has awarded a contract to the Railroad Water & Coal Handling Company, Chicago, for the construction of a 15,000 gal. per hour capacity water treating plant at Benton, Mo.

The Northern Alberta Railways, it is reported in dispatches from Edmonton, are to be extended, as a result of agreements having been reached between the provincial government and the McArthur and Union Bank interests. It is possible that the railway department of the Alberta government will do the construction work rather than the Canadian Pacific Railway.

The Northern Pacific contemplates the construction of a subway under its yards at Auburn, Wash., to replace two viaducts now used.

The Oregon Short Line will construct a secondary main line from Orchard, Idaho, to Boise, estimated to cost over $3,000,000.

The Pacific Electric contemplates the construction of a subway at Olive street, Los Angeles, Cal., and has been granted permission by the Railroad Commission of California to construct, jointly with the Southern Pacific, a bridge over the Santa Ana river at El Moro, Cal.

The Pennsylvania will shortly begin the construction of a 3,000,000-gal. reservoir in the Enola yard on its low grade freight line, just west of Harrisburg, Pa. The new reservoir will be constructed of clay and earth lined with concrete.

The Pere Marquette will construct ice houses at Ludington, Mich., Port Huron and Farwell, and shop improvements at Wyoming, Mich., and Grand Rapids.

The St. Louis-San Francisco plans the construction of a new freight and passenger station at Bristow, Okla., to cost approximately $30,000, and has awarded a contract to John M. Olsen, Springfield, Mo., for the construction of a passenger station at Springdale, Ark., reported in the February issue. This company has awarded a contract to the same contractor for the construction of a mill shop building at Enid, Okla.; has awarded a contract to the Jarrett Construction Company, Springfield, Mo., for a four-stall addition to the roundhouse at West Tulsa, Okla., and a five-stall addition to the roundhouse at Ft. Scott, Kan., and plans the construction of new shop buildings at St. Louis, Mo., and at East Thomas, Ala. Each group will be of concrete, brick and steel construction and will consist of a roundhouse, machine shop, power house, mill shop, car repair shop and storeroom. The cost of the new facilities will be approximately $500,000 at each place.

This company closed bids on February 28 for the construction of the nine miles of second track from Valley Park, Mo., to Eureka, and the double tracking of the bridge over the Arkansas river at Tulsa, Okla., reported in the February issue.

The Southern New England, a subsidiary of the Central Vermont, will take immediate steps to complete its partly built line from Palmer, Mass., to Providence, R. I., 83 miles, if the Rhode Island legislature will extend for two years its franchise according to press dispatches from Providence. A considerable part of the line was graded in 1910-1912.

The Southern Pacific contemplates the construction of a new freight and passenger station at Reedsport, Ore., and a new passenger station at Sacramento, Cal.

Ths company plans the construction of a 13 mile line, from Magunden, Kern County, Cal., to Arvin, and approximately 43 miles of second track on the line of the Central Pacific in California and Nevada, and will construct a 118-mile line from Oakridge, Ore., to Kirk.

The Southern Pacific of Mexico, will complete the construction of its line in Mexico from Tepic to Guadalajara, thereby furnishing a through route into Mexico City.

The Texas & Pacific will construct new shop buildings and terminal facilities at Alexandria, La., to cost approximately $1,000,000.

The Toledo, Peoria & Western has awarded a contract to the Ogle Construction Company, Chicago, for the construction of a 100-ton capacity frame coaling station at Fairbury, Ill.

The Toledo Terminal Railway Company has awarded a contract to the Ogle Construction Company for the erection of a 200-ton, two-track, reinforced concrete coaling and sanding station at Toledo, Ohio.

The Utah Central has received authority from the Interstate Commerce Commission to construct a new line extending from coal mines in Huntington Canyon to Healy, Utah, on the Utah Railway, 21 miles, with an additional branch line.

The Western Pacific contemplates the construction of a new yard and related facilities at Stockton, Cal.

The Wyoming has applied to the Interstate Commerce Commission for a certificate authorizing the construction of an extension of 125 miles from Buffalo to Casper, Wyo.

Equipment and Supplies

The American Short Line Association is inquiring for the following second-hand material: one through deck girder 100 ft. long and enough girders of 200 to 300 ft. to span 1,800 ft., one 50-ft. span draw bridge, one 60-ft. skew girder span, one 33-ft. girder span, two 70-ft. deck plate girders and two 50-ft, girders; 50 tons of 20-lb, rail, 10 miles of 40-lb., 20 miles of 56-lb., 12 miles of 60-lb., 10 miles of 70-lb, eight miles of 85-lb., and 10 miles of 90-lb. rail; one track scale of 100 tons capacity; two turntables of 50 to 75 tons capacity and one fuel oil storage tank of 10,000 gal. capacity.

The Baltimore & Ohio is inquiring for from 800 to 900 tons of steel for bridges.

The Baltimore & Ohio has ordered 2,600 tons of structural steel from the American Bridge Company, for an elevator at Locust Point, Md.

The Chicago & North Western has ordered from the American Bridge Company 127 tons of miscellaneous structural steel, and 3,000 tons of structural steel for bridge renewals.

The Chicago, St. Paul, Minneapolis & Omaha has ordered 297 tons of structural steel for bridge renewals from the American Bridge Company.

The Cleveland, Cincinnati, Chicago & St. Louis, has ordered 600 tons of structural steel from the Ft. Pitt Bridge Company, for use at Indianapolis, Ind.

The Delaware, Lackawanna & Western is inquiring for 1,200 tons of steel for bridges.

The Louisville & Nashville has ordered 300 tons of structural steel from the Virginia Bridge & Iron Company, for bridge work at Evansville, Ind.

The Minneapolis & St. Louis has ordered 443 tons of structural steel from the McClintic-Marshall Company, for remodeling the approaches and repairs to the Fifth street, north bridge, Minneapolis, Minn.

The Oregon Short Line has ordered 699 tons of structural steel from the McClintic-Marshall Company.

The Pacific Fruit Express has ordered 100 tons of structural steel from the Pacific Rolling Mill for its car repair plant at Colton, Cal.

The Pennsylvania has ordered 350 tons of structural steel from the Belmont Iron Works.

The Pere Marquette has ordered 2,243 tons of structural steel from the Whitehead & Kales Iron Works for the construction of shops at Grand Rapids, Mich.

The St. Louis-San Francisco has ordered from the American Bridge Company 18 deck plate girder spans aggregating 779 tons for a bridge across the Arkansas river at Tulsa, Okla., and 1,144 tons of through riveted and deck spans.

The St. Paul Union Station Company has ordered 264 tons of structural steel from the St. Paul Foundry Company for the Union Depot train shed.

The Union Pacific has ordered 1,625 tons of structural steel, 400 tons of which is from the McClintic-Marshall Company for a locomotive erecting and boiler shop at Los Angeles.

Supply Trade News

General

The Fairmont Gas Engine & Railway Motor Car Company has changed its corporate name to Fairmont Railway Motors, Inc., Fairmont, Minn.

The Reliance Manufacturing Company, Massillon, Ohio, has opened a district sales office in the Fullerton building, St. Louis, Mo., in charge of A. C. Rule.

The Kirby-Bonner Lumber Company, Houston, Texas, has removed its eastern sales offices from 120 Broadway to room 2612 Grand Central Terminal, New York City.

The Hall Brothers Cedar Company has removed its general office from Jacksonville, Tex., to Coeur d'Alene, Idaho. In its new location the company will engage in the manufacture and wholesaling of western cedar posts, poles and piling.

The Truscon Steel Company, Youngstown, Ohio, has purchased the National Steel Joist division of the Central Steel Company, Massillon, Ohio, and will continue the operation of the plant at Massillon until the new buildings now provided at Youngstown are completed, at which time the equipment will be transferred and the operation at Massillon discontinued.

The Standard Conveyor Company, North St. Paul, Minn., has acquired by purchase all of the rights, titles and patents pertaining to the portable and sectional piling, elevating, conveying, loading and unloading machinery for the handling of packed and loose materials, manufactured by the Brown Portable Conveying Machinery Company, North Chicago, Ill., for the past ten years.

The Q. & C. Company, New York, has taken over the exclusive sales for the Interstate one-piece guard rail formerly manufactured and sold by the Interstate Railway Supply Company, Cleveland, Ohio. This device will be known as the Q. & C. Interstate one-piece guard rail. This company has also been appointed sole selling agent for the Trench-Zepp stone ballast cleaner, made by Littleford Brothers, Cincinnati, Ohio. The device will be known as the Q. & C. Zepp stone ballast cleaner.

The Charter Gas Engine Company, Sterling, Ill., has bought the Mietz oil engine business, heretofore carried on in New York City by the August Mietz Corporation and the Reliance Oil Engine Corporation, and is moving to its plant at Sterling, all of the physical assets of the acquired business, in order to handle which, arrangements have been made for additional floor space at Sterling, giving about double the present area. A number of the August Mietz Corporation organization will continue with the new company.

Personal

C. O. Poor has been elected managing director of the P. & M. Company, Ltd., Montreal, with headquarters at 1002 McGill building.

James V. Davison, representative of the National Malleable Castings Company, with headquarters at Cleveland, Ohio, died on March 14, in that city.

A. W. Berghoefer has again become associated with the Gifford-Wood Company, Hudson, N. Y., with offices at the company's New York City office, 50 Church street.

William H. Schutte, who has been identified for a long time with the Chicago selling force of the Blaw-Knox Company, Pittsburgh, Pa., has been promoted to the managership of its Chicago office.

Lawrence F. Whitney has joined the New England sales organization of the Reading Iron Company, Reading, Pa., at 161 Devonshire street, Boston, Mass., where he will assist the district sales manager for New England.

A. H. Talbot has opened an office at 237 Railway Exchange buildng, Chicago, under the firm name A. H. Talbot-Railway Equipment, to deal in railway locomotives, cars and rails. A. M. Talbot, formerly secretary and treasurer of J. T. Gardner, Inc., Chicago, will be in charge.

Stanley H. Smith, formerly sales agent for the Pennsylvania Steel Company in Chicago and Cleveland and sales agent of the Bethlehem Steel Company in Cleveland, has recently opened a warehouse for the Wyoming Shovel Works at 422 Frankfort avenue, Cleveland, Ohio, where he will also represent the Harrisburg Pipe & Pipe Bending Company, the National Lock Washer Company and the Stevens Metal Products Company.

David Augustus Decrow, manager of the waterworks department of the Worthington Pump & Machinery Corporation, New York, died in East Orange, N. J., on February 15. Mr. Decrow was born in Bangor, Me., and graduated from Maine State College of Mechanic Arts of the University of Maine at Orona, in the class of 1879. He served as a mechanical draftsman with the Holly Manufacturing Company, and in 1893 was appointed designing engineer. In 1900, he became chief engineer and in 1903, secretary of the same company. When the Holly Manufacturing Company was combined with the Snow Steam Pump Works, at Buffalo, N. Y., as part of the International Steam Pump Company, Mr. Decrow became representative of both companies at Buffalo. The International Steam Pump Company was succeeded by the Worthington Pump & Machinery Corporation in April, 1916, whereupon Mr. Decrow became manager of the waterworks department with offices in New York, continuing in this position until his death.

A. A. Taylor, manager of the railroad division of Fairbanks, Morse & Company, with headquarters at Chicago, has resigned to become vice-president and general manager of the Locomotive Firebox Company, with the same headquarters. Mr. Taylor was born at Yates City, Ill., on December 3, 1869, and entered railway service in 1887 in the office of the vice-president of the Chicago, Burlington & Quincy, at Chicago. In 1889, he entered the employ of Westinghouse, Church, Kerr & Company, Chicago, where he remained until 1891, when he entered the sales department of the Morden Frog & Crossing Company, Chicago. From 1896 to 1899, he was employed by the Cable Piano Company, Chicago, and on February 1, 1899, entered the employ of Fairbanks, Morse & Company, Chicago, as a salesman in the railroad department in the territory east of the Mississippi river and south of the Ohio river. In 1906, he was promoted to manager of that part of the railroad department operating from Chicago, and in September, 1915, was promoted to manager of the railroad division, including the construction department, in charge of all railroad business in the United States and foreign countries, which position he held up to the time of his resignation.

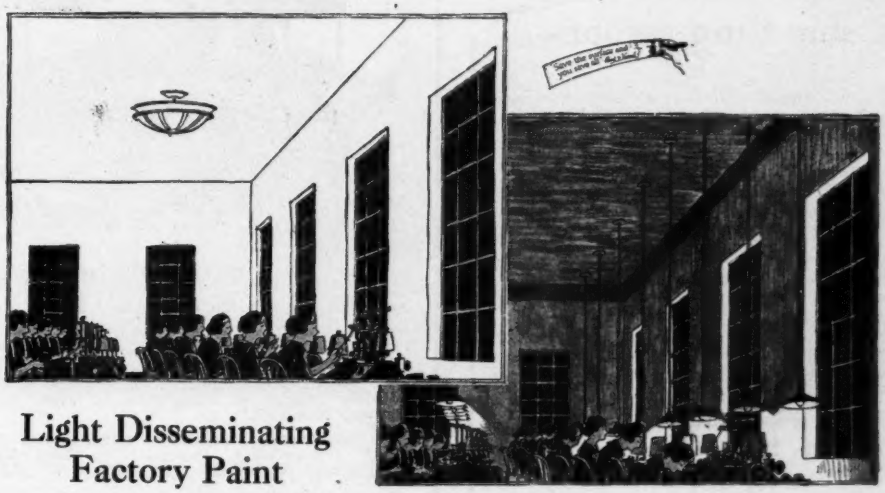
A. A. Taylor

Trade Publications

Coaling Plants.—The Howlett Construction Company, Moline, Ill., has issued a booklet containing line drawings and photographic illustrations of various types of coaling equipment it has recently built for railways, together with illustrations and specifications concerning its line of hoists, car pullers, coaling aprons and other machinery adapted for this use. The principal coaling stations illustrated are concrete plants built for the St. Louis-San Francisco and Louisville, Henderson & St. Louis, and frame plants built for the Great Northern and Illinois Central.

Save Coal!

Light your plant with proper paint



Light Disseminating Factory Paint

Saves in coal where plants generate their own light and saves in dollars where current is bought.

Many modern plants are built to take every advantage of natural light. Although sunlight may darken ordinary light reflecting paints, paint made with The New Jersey Zinc Company's

Zinc Oxide and Albalith

embodies a distinctly individual achievement. It does not darken from sunlight on the brightest days and on dark days it produces maximum dissemination of light throughout the factory space. Write us for our factory lighting formula, combining The New Jersey Zinc Company's Zinc Oxide and Albalith.

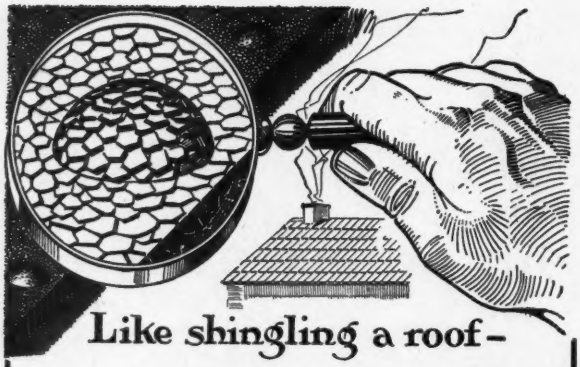
THE NEW JERSEY ZINC COMPANY

160 Front Street (Established 1848) New York City

CHICAGO: Mineral Point Zinc Company SAN FRANCISCO: The New Jersey Zinc Sales Co.
PITTSBURGH: The New Jersey Zinc Sales Co. CLEVELAND: The New Jersey Zinc Sales Co.

New Jersey zinc

The World's Standard for Zinc Products



Like shingling a roof–

You shingle a roof with flat pieces—not round balls. Ordinary paint is made up of globular particles while Dixon's Paint is made up of *flakes* of graphite—like shingles—giving entire protection to every inch of surface.

The pigment in

DIXON'S
Silica Graphite Paint

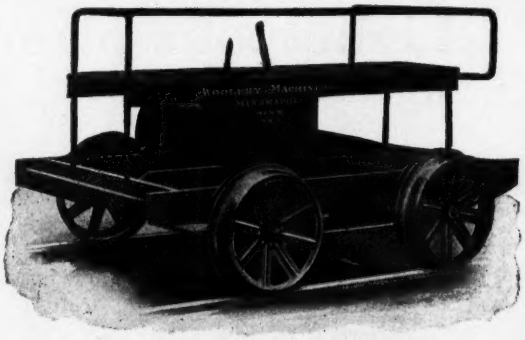
is Nature's combination of flake silica-graphite and as such is inert and immune to attack by gases, acids, alkalies, and is unaffected by varying climatic conditions. This pigment affords the most tenacious and resistant paint film known.

Dixon's Paint will lower your paint costs and afford better protection for a longer period of time.

Write today for Booklet No. 187-B and records of long service in your line.

JOSEPH DIXON CRUCIBLE COMPANY
Established 1827 JERSEY CITY, N. J.

WOOLERY
BALL-BEARING RAILWAY MOTOR CARS



PATENT APPLIED FOR

Adapted to Section, Extra Gang and Bridge Work.

Ball Bearings take the end thrust as well as the load—no side play—no wear on axles. 100% overload capacity.

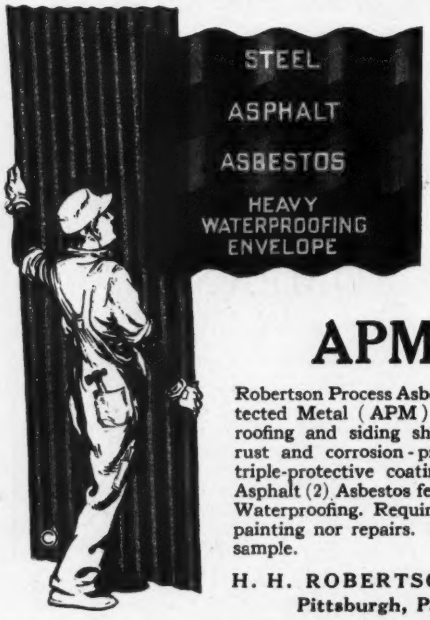
No thrust washers to wear away and cause short circuits and operation of electric signals. This is an exclusive Woolery feature of importance to every Railroad using Railway Motor Cars.

Low Gas Consumption, Simple Construction, Easy Starting, Quick Reversibility, Dependability, Low Upkeep, Light Weight and Remarkable Power mark WOOLERY Engines.

5 and 7½ H. P. Single Cylinder. 10 and 15 H. P. Twin Cylinder.

WOOLERY MACHINE CO., Minneapolis, Minn.

For Roofs and Siding on Railroad Buildings



APM

Robertson Process Asbestos Protected Metal (APM)—a steel roofing and siding sheet made rust and corrosion-proof by a triple-protective coating of (1) Asphalt (2) Asbestos felt and (3) Waterproofing. Requires neither painting nor repairs. Write for sample.

H. H. ROBERTSON CO.
Pittsburgh, Pa.

ROBERTSON PROCESS APM
ASBESTOS PROTECTED METAL

WATER PURIFICATION

by softening or filtration has long since proved its economy and during the past several months, when motive power has been taxed to the limit, much evidence has been accumulated which will *convince you* that those divisions having water purifying installations have operated more efficiently, by far, than most other divisions not so equipped.

Railways using A W S equipment are constantly extending its use on other divisions with increasing profit.

We will be specific in pointing to definitely known savings.

A W S equipment now in use by many of the largest railways.

AMERICAN WATER SOFTENER COMPANY
Fairhill P. O. Station PHILADELPHIA, PA.
Specialists for 20 years in railroad water purification.

THE JORDAN SPREADER-DITCHER

"Does the work of an army of men"

A Jordanized Ditch

Ditching with a Jordan saves time, labor, money.

O. F. JORDAN COMPANY, East Chicago, Indiana

INLAND STEEL RAILS

STANDARD HEAVY TEE RAILS

ROLLED FROM

RE-HEATED BLOOMS

INLAND STEEL COMPANY

38 So. Dearborn Street, Chicago

Works:
Indiana Harbor, Ind.
Chicago Heights, Ill.

Branch Offices:
Milwaukee, Wis. St. Louis, Mo.
St. Paul, Minn.

PUMPS

INDUSTRIAL-AGRICULTURAL-MUNICIPAL-RESIDENTIAL

A TYPE FOR EVERY SERVICE

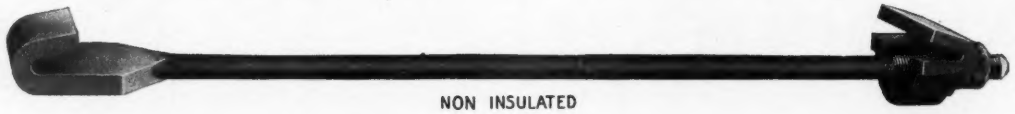
Bulletins on request.

THE GOULDS MANUFACTURING COMPANY

SENECA FALLS, N. Y.

GOULDS

BETHLEHEM Gage Rods



NON INSULATED

INSULATED

FIBRE BUSHING METAL WASHER STANDARD HEX. NUTS

Bethiehem Gage Rods recommend themselves to roads wishing to carry but one style of rod for both insulated and non-insulated service. The simple addition of a fibre bushing converts the non-insulated rod, Design 855, to the insulated rod, Design 856.

The rod itself is made in one piece of rolled and forged steel, and the adjustable jaw is forged from a ¾ inch steel plate. The fibre bushing used only in the insulated design is well protected and does not come in contact with any parts subject to heavy wear.

BETHLEHEM STEEL COMPANY, *General Offices:* BETHLEHEM, PA.

Sales Offices:

New York Boston Philadelphia Baltimore Washington Atlanta Pittsburgh Buffalo Cleveland Detroit Chicago St. Louis San Francisco

Bethlehem Steel Export Corporation, 25 Broadway, New York City, Sole Exporter of our Commercial Products

The Frog, Switch & Manufacturing Company

Carlisle Pennsylvania

Established 1881

FROG AND SWITCH DEPARTMENT

MANUFACTURERS OF
MANGANESE INSERT FROGS, CROSSINGS AND SPLIT SWITCHES
SOLID MANGANESE FROGS AND CROSSINGS
PLAIN FROGS, SWITCHES, CROSSINGS
SWITCH STANDS AND ACCESSORIES

MANGANESE STEEL DEPARTMENT

MANUFACTURERS OF
"INDIAN BRAND"
HIGH GRADE MANGANESE STEEL CASTINGS
FOR FROGS, SWITCHES AND CROSSINGS
JAW AND GYRATORY CRUSHERS
CEMENT MILL, MINING MACHINERY, ETC.
GRAY IRON CASTINGS

Specialists in the Design and Manufacture of

Standard—Insulated—Compromise Rail Joints

The Rail Joint Company, 61 Broadway, New York City

A Working Principle—Not an Embalmed Ideal

A B P STANDARD No. 2
"To subscribe to and work for TRUTH and honesty in ALL departments."

FEW there are who do not know of the great TRUTH and BETTER BUSINESS movement, which was inaugurated by the Associated Advertising Clubs of the World about ten years ago.

It was the fused and awakened sentiment of the publishing and advertising interests, that to them belonged the responsibility for purifying the stream of publicity and keeping it clean.

Since then these men have procured the adoption of clean advertising laws in nearly every state, with Vigilance Committees to enforce them. The crooks and swindlers have been driven from the pages of reputable publications, and the power and virility of straight truth-telling has been brought home to all advertisers.

As the Business Press Department of the National Advertising Commission of the A. A. C. of W., The Associated Business Papers, Inc., is proud and glad to be a part of this work. We have incorporated the TRUTH motive into our own standards and our practices.

Note well the word "ALL" in Standard No. 2. It applies with equal force to ***all*** departments of our papers—editorial as well as advertising.

As a logical sequence of Standard No. 2, we adopted Standard No. 5

A B P STANDARD No. 5
"To decline any advertisement which has a tendency to mislead, or which does not conform to business integrity."

THIS imposes a definite obligation upon A B P papers which can not be misunderstood. In this Standard, our publishers plainly acknowledge their responsibility to their subscribers, and pledge themselves to keep the trusteeship inviolate.

Do you not begin to see why business papers aspire to A B P membership; why membership carries the prestige that it does; and why A B P papers are getting preferred consideration from those who believe in high standards especially when coupled with practical achievement?

THE ASSOCIATED BUSINESS PAPERS, INC.

JESSE H. NEAL, *Executive Secretary*

HEADQUARTERS: 220 WEST 42nd STREET NEW YORK CITY

Any of These Lubrication Troubles at your Pumping Stations

?

Is it necessary to keep lubricator wide open to get sufficient lubrication—to keep engine from sticking?

Is maximum speed attained, less than engine's r. p. m. rating?

Heavy deposits of dry, hard carbon forming, causing piston rings to stick?

Necessary to use a crow bar to turn engine over in starting?

They disappear when TEXACO LUBRICATION is used

A test of Texaco was made at a pumping station resulting in the elimination of the troubles listed: Feed of lubricator cut to one-third and on second day of test, cylinders showed perfect lubrication, rings free.

Speed increased on third day of test to better than 400 r. p. m. (engine's rating—400) as against former speed of 370 r. p. m.

On second day of test the old carbon deposits were becoming oil soaked and softening up so they could be easily removed. Interior of crank case examined and crank pin well lubricated.

During test of Texaco, engineer never had to use crow bar to turn engine, but did it very easily by taking hold of fly weel with his hands.

THE TEXAS COMPANY

Railway Sales Department

Atlanta New York Houston Chicago

OFFICES IN PRINCIPAL CITIES

There's a Texaco Lubricant for Every Purpose

Handle Coal with a BLAW-KNOX SPEEDSTER

Built to fit your crane and work fast

Ruggedly constructed—the Blaw-Knox Speedster requires little maintenance expense.

Write for literature.

BLAW-KNOX CO.
639 Farmer's Bank Building
Pittsburgh, Pa.

BLAW-KNOX BUCKETS

WHARTON

SWITCHES FROGS CROSSINGS SPECIAL TRACKWORK

of all Constructions

Originators of

MANGANESE STEEL TRACKWORK

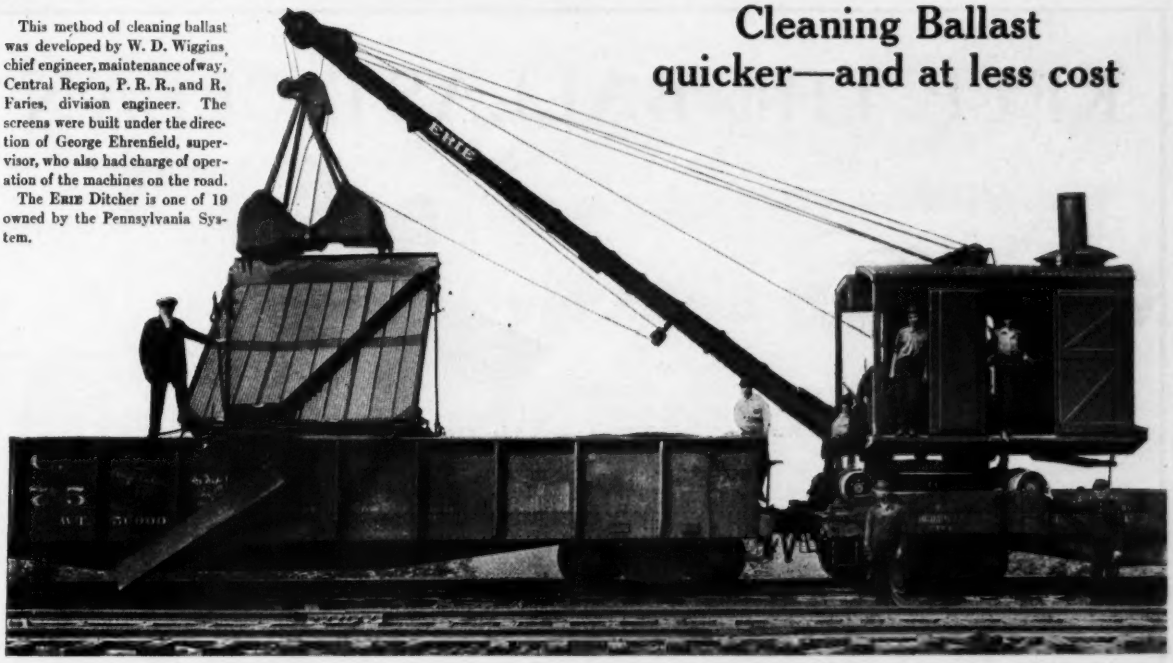
WM. WHARTON JR. & CO., Inc.

EASTON, PA.

Cleaning Ballast quicker—and at less cost

This method of cleaning ballast was developed by W. D. Wiggins, chief engineer, maintenance of way, Central Region, P. R. R., and R. Faries, division engineer. The screens were built under the direction of George Ehrenfield, supervisor, who also had charge of operation of the machines on the road.

The ERIE Ditcher is one of 19 owned by the Pennsylvania System.



Another of the ways in which ERIE Ditchers are cutting costs on railroad construction and maintenance.

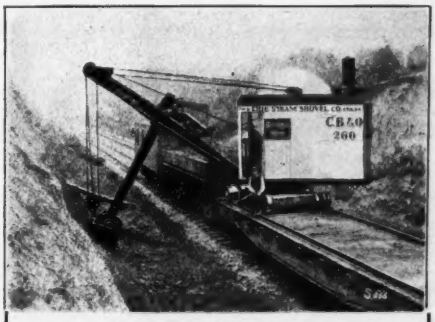
CLEANING BALLAST: When using the method shown by the above photo, the ballast is first forked to the space between the tracks, then picked up by the ERIE Crane with Clamshell Bucket. The ballast is dumped to a screen mounted on a steel gondola. Dirt goes through the screen into the car, while the clean ballast runs off the screen down through the chute, and back to the track center.

After the clean ballast has been leveled off, the track is ready for a light dressing of new stone.

Using the ERIE Ditcher for ballast cleaning, 2 laborers, a foreman, and a regular train crew will do the work of about 40 hand laborers. Working day and night shifts the ERIE shown above cleaned as high as 3936 feet of center ditch on one Sunday; on one single week-day shift of 8 hours, it cleaned 1750 feet. An average of two months' work is approximately 1000 feet per shift of 8 hours.

Besides the great saving in labor and the greater progress made, the ballast is much cleaner than when the hand method is used and there is less stone wasted.

We have some very interesting photos and data which will give you a clear idea of how the ERIE will speed up your work and save you labor on railroad ditching, slide removing and many other kinds of work. Will be glad to send them to you without obligation. Just write us.

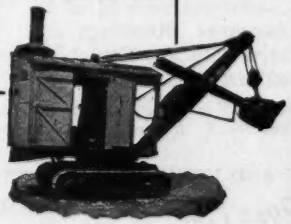


With ditcher boom and dipper, for ditching service

After using your ERIE as locomotive crane with clamshell bucket for ballast cleaning, handling scrap, refuse or bulk material, or for handling rails, timbers, etc., it's an easy job to put on the ditcher boom and dipper for ditching or for removing slides. You don't send the ERIE to the shops to put on the ditching equipment—any ordinary mechanic can easily do the work in a few hours right on the job.

Used for all kinds of excavating

The ERIE also gives splendid results digging scale pits, turntable pits, roundhouse or shop foundations, grading for double track, new spur tracks or new roadbed. The all-around usefulness of the ERIE Ditcher is just another reason why so many railroad officials prefer the ERIE.



Can be quickly mounted on traction wheels, or the ERIE *lubricated* caterpillar type mounting, for operating on the ground and traveling under its own power. The three different kinds of mounting are easily interchangeable on the same truck frame.

ERIE STEAM SHOVEL CO., Erie, Pa., U. S. A.

Incorporated 1883. Formerly BALL ENGINE CO.

Builders of ERIE Steam Shovels, Locomotive Cranes, Railway Ditchers

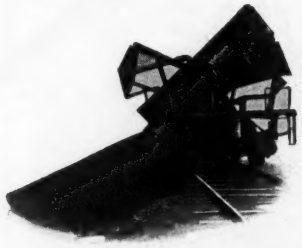
Branch Offices: Boston, New York, Philadelphia, Pittsburgh, Chicago
Representatives throughout the U. S. A.

ERIE

KEEP THE BALLAST CLEAN

Western

That's Why



Western Air Dump Car With Apron

DON'T dump the muck from your ditches on to your ballast. Western Air Dump Car equipped with extension apron throws the load beyond the ballast line. This practical device is simplicity itself—strong and rigid—operates automatically—discharges the load 40 inches beyond the rail—can be attached to any Western Dump Car, old or new. It solves your problem.

Western Air Dumps are made in 12, 16, 20, 30 and 45 cubic yard sizes. Bulletin M-22-J describes the apron

WESTERN WHEELED SCRAPER COMPANY

Earth and Stone Handling Equipment

AURORA, ILLINOIS

ESTABLISHED 1882

THE WEIR FROG CO.

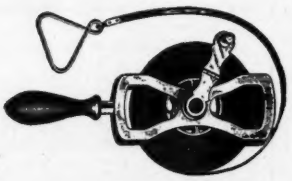
Track Work of Rail and
Manganese Steel Construction

Manufacturers of Balkwill Articulated Cast Manganese Crossings

CINCINNATI - - - OHIO

STURDY AND RELIABLE

LUFKIN TAPES

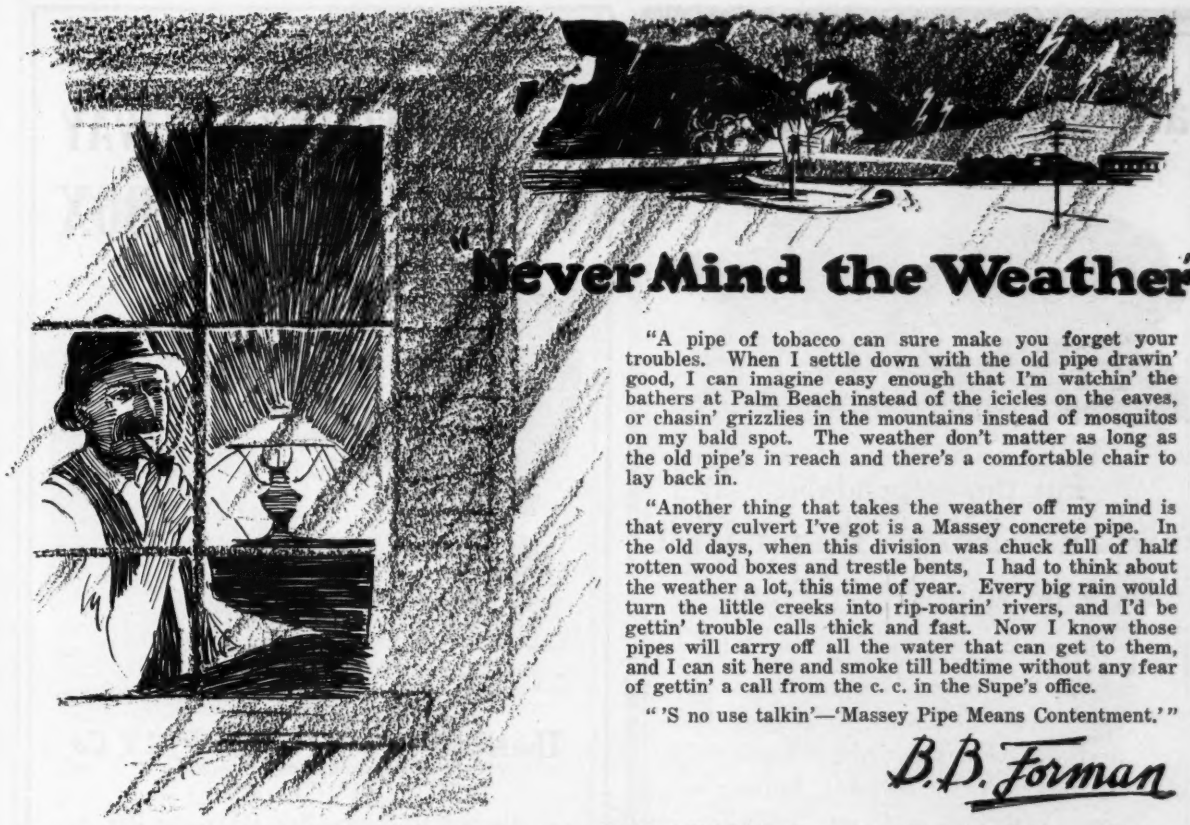


In Patterns Best for Every R. R. Requirement—Surveying—Engineering—Construction—M. of W. Steel Tapes with ***Instantaneous*** Readings and Nubian Finish. **Babbitt Chain** (Chicago Style) **Tapes** with ½ gage mark and improved pattern reels.

Among our popular woven lines are the **"Metallic,"** and the low priced tapes for all common uses, the **Ass Skin,** and the **Universal No. 733R Linen Corded** with **First Three Feet Reinforced.**

STOCKED BY RAILWAY SUPPLY AND HARDWARE HOUSES.

Send for Catalogue — THE LUFKIN RULE CO. — SAGINAW, MICH. New York Windsor, Ont.



"Never Mind the Weather"

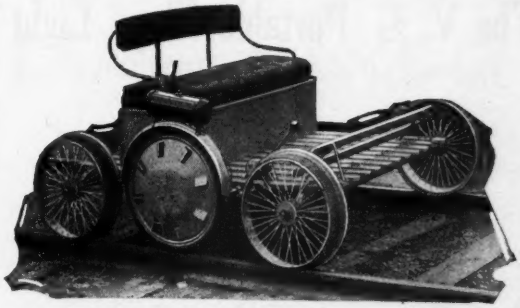
"A pipe of tobacco can sure make you forget your troubles. When I settle down with the old pipe drawin' good, I can imagine easy enough that I'm watchin' the bathers at Palm Beach instead of the icicles on the eaves, or chasin' grizzlies in the mountains instead of mosquitos on my bald spot. The weather don't matter as long as the old pipe's in reach and there's a comfortable chair to lay back in.

"Another thing that takes the weather off my mind is that every culvert I've got is a Massey concrete pipe. In the old days, when this division was chuck full of half rotten wood boxes and trestle bents, I had to think about the weather a lot, this time of year. Every big rain would turn the little creeks into rip-roarin' rivers, and I'd be gettin' trouble calls thick and fast. Now I know those pipes will carry off all the water that can get to them, and I can sit here and smoke till bedtime without any fear of gettin' a call from the c. c. in the Supe's office.

"'S no use talkin'—'Massey Pipe Means Contentment.'"

B. B. Forman

MASSEY CONCRETE PRODUCTS CORPORATION, Peoples Gas Building, Chicago



The Teetor Railway Speed Car

LIGHT in weight—motor driven—easily lifted from the track by one man—economical to operate—strong, durable, and reliable! These are the outstanding advantages of the Teetor Railway Speed Car—the result of years of experimenting by an old-established manufacturer of light inspection cars. Teetor Railway Speed Cars are now ready for delivery. Write for full information.

SPECIFICATIONS

Weight	—200 pounds
Pass. Capacity	—Two Persons and Equip.
Motor	—Briggs & Stratton Motor Wheel
Speed	—2 to 20 Miles per Hour
Gasoline Mileage	—40 to 50 Miles per Gallon

Manufactured by

INDIANA PISTON RING CO., Hagerstown, Ind.

For Water Supply, **Dependability** is the first requisite of a satisfactory compressor.

At the Duncan, Oklahoma Water Works, a **Sullivan "WG-3" Compressor** two years old, ran steadily from Sept. 1 to Dec. 26, 1921, at 280 R. P. M., against 130 lb. pressure, in air lift service, pumping 75 gallons per minute against a lift of 430 feet. The ordinary rating of this machine is 100 lb. working pressure and 235 R.P.M. This very great overload was handled without the slightest delay or trouble.

WG-6 Compressors are single-stage, belt-driven wafer valve units, capacity 60-500 cubic feet. **Bulletin 1977-E.**

Sullivan Machinery Company

411 Gas Bldg. Chicago

Fairbanks-Morse Pumps

Put this dependable
Fairbanks-Morse Pump Unit
Back of your Water Supply

This motor driven, multi-stage split case Centrifugal Pump is desirable for service against heads up to 500 feet. Chemical plants, municipalities, factories, mills, office buildings, units and apartments find these dependable booster stations. They are also used extensively for high pressure irrigation, marine or hydraulic elevator service.

The Fairbanks-Morse Ball Bearing Motor driving this pump is built sturdy and strong for hard continuous operation. It has the original jointless rotor construction—end rings cast onto solid copper bars. Strong, cast frame—solid base with broad feet to resist strains and twists. All Fairbanks-Morse Motors are 40 degree machines.

One Manufacturer
One Responsibility

Fairbanks, Morse & Co.
MANUFACTURERS CHICAGO
Oil Engines · Pumps · Electric Motors and Generators · Fairbanks Scales · Railway Appliances · Farm Power Machinery

MURDOCK
"SAFETY FIRST" RAILWAY WATER SERVICE BOX

FOR

Pat. Applied For

Type "B" with Westinghouse Coupler

Type "A" with Common Hose Coupling

Coach Yard and Terminal
Positively Self-Closing
Either Full On or Completely Off
No Leakage No Waste
No Repairs No Freezing
Nothing to Stumble Over

ALSO

"GENUINE" MURDOCK
SELF-CLOSING HYDRANTS

DRINKING FOUNTAINS
Fool-proof, for Shops, Stations, Offices

Write for Full Information

The MURDOCK MFG. & SUPPLY Co.
"THE ORIGINAL HYDRANT HOUSE"
CINCINNATI, OHIO.
Makers of Anti-Freezing Water Devices since 1853

The V. G. Portable Flood Light

5,000 C. P. — 10 Hours — 25 Cents

The V. G. Flood Light

FEATURES:

Carbide and water in entirely separate compartments.

Absolute safety.

No waste of carbide.

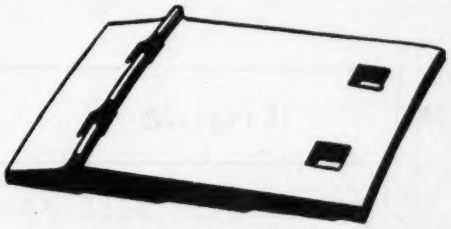
Will operate extension lights and cutting torches.

Not affected by weather.

Re-charging—easy and clean work.

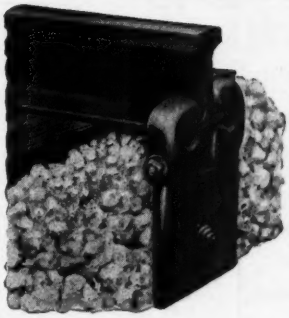
A necessary equipment for all railroad divisions.

The Blake Mfg. Co.
Mansfield, Pa.



The Lundie Tie Plate

Will give rail and wheels longer life.
Will hold gauge and not injure a single fibre of the tie.
Will not rattle.



The Lundie Duplex Rail Anchor

Requires only one anchor per rail.

Will hold in both directions.

The Lundie Engineering Corporation
920 Broadway, New York
166 West Jackson Boulevard, Chicago

Kilby Frog & Switch Co.

Birmingham, Ala.

Manufacturers of

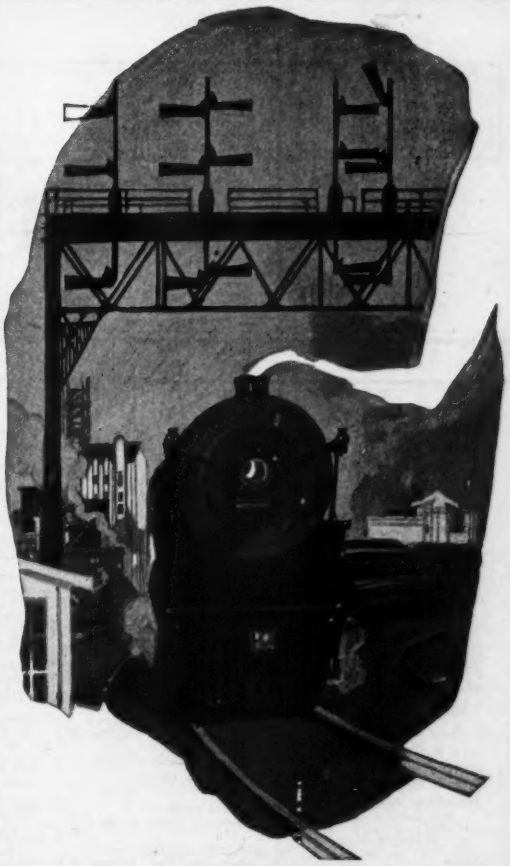
Railroad Crossings, Frogs and Switches

Manganese Track Work a Specialty

Balkwill Cast Manganese Articulated Crossings

Graham Flange Frogs

(*The Savers of Maintenance*)



SAFETY

to everybody concerned

Diamond Fibre and dependable block joint insulation travel hand in hand. Write it in your specifications and everybody is safe.

Diamond Fibre serves faithfully because it is a tough, strong, almost indestructible insulation made by practical men to meet practical railroad conditions. "Old Timers" depend upon it because it more than meets standard specifications.

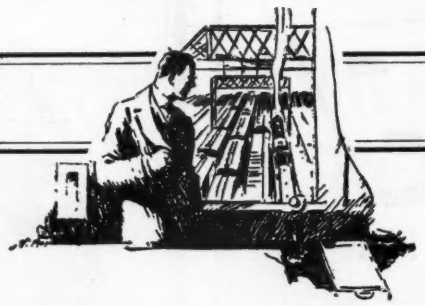
For more exacting work—where extreme waterproof and extremely high electrical qualities are essential—use Condensite Celoron.

F Diamond-F

Write today for a sample of Diamond Fibre and Condensite Celoron. Both are materials about which every practical railroad man should be fully informed.

Diamond State Fibre Company
Bridgeport (Near Philadelphia) Pa.
Branch Factory and Warehouse, Chicago
Offices in Principal Cities
In Canada: Diamond State Foundry Company, Limited
245 Carlaw Ave., Toronto

Buyers' Guide



CLASSIFIED INDEX OF ADVERTISERS

Acetylene, Dissolved.
Air Reduction Sales Co.

Adjustable Rail Clamps.
Wm. Wharton, Jr., & Co.

Air Aftercoolers.
Ingersoll-Rand Co.

Air Compressors.
Fairbanks, Morse & Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Air Hoists.
Ingersoll-Rand Co.

Air-Lift Pumping Systems.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Anchors, Rail.
P. & M. Co., The

Anti-Creepers.
P. & M. Co., The.

Apparatus, Brazing, Welding and Cutting, Heat Treatment.
Air Reduction Sales Co.

Argon.
Air Reduction Sales Co.

Asbestos Protected Metal.
Robertson Co., H. H.

Asphalt.
Ruberoid Co., The.

Band Saws
American Saw Mill Co.

Barrels.
Diamond State Fibre Co.

Bars.
Bethlehem Steel Company.

Bearings, Axle, Motor and Push.
Fairmont Gas Engine & Ry. Motor Car Co.

Benders, Rail.
Q. & C. Co.
Verona Tool Works.

Billets.
Bethlehem Steel Company.

Blasting Powders.
E. I. du Pont de Nemours & Co.

Blasting Supplies.
E. I. du Pont de Nemours & Co.

Blow Pipes, Oxy-Acetylene.
Air Reduction Sales Co.

Bolts.
Bethlehem Steel Company.
Selflock Nut & Bolt Co., Inc.

Bonding, Rail Outfits.
Ingersoll-Rand Co.

Bond Wire.
Armco Culvert & Flume Mfrs. Assn.

Brazing.
Air Reduction Sales Co.

Buckets.
Blaw-Knox Co.

Buildings, Sectional, All Steel.
Blaw-Knox Co.

Building Materials.
Robertson Co., H. H.

Burners, Bunsen, Acetylene.
Air Reduction Sales Co.

Calcium Carbide.
Air Reduction Sales Co.

Cars, Dump.
Western Wheeled Scraper Co.

Cars, Hand and Push.
Fairbanks, Morse & Co.
Fairmont Gas Engine & Ry. Motor Car Co.
Mudge & Co.

Cars, Industrial.
Western Wheeled Scraper Co.

Cars, Motor, Inspection.
Fairbanks, Morse & Co.
Fairmont Gas Engine & Ry. Motor Car Co.
Indiana Piston Ring Co.
Maintenance Equipment Co.
Mudge & Co.
North American Engine Co.

Cars, Motor, Section.
Fairbanks, Morse & Co.
Fairmont Gas Engine & Ry. Motor Car Co.
Maintenance Equipment Co.
Mudge & Co.
North American Engine Co.

Cars, Spreader.
Western Wheeled Scraper Co.

Cars, Velocipede.
Fairmont Gas Engine & Ry. Motor Car Co.
Indiana Piston Ring Co.
Maintenance Equipment Co.
Mudge & Co.

Castings.
Bethlehem Steel Company.

Cattle Guards.
Fairbanks, Morse & Co.

Cattle Passes.
Massey Concrete Prod. Corp.

Chisels, Track.
Warren Tool & Forge Co.

Crushers, Stone.
Western Wheeled Scraper Co.

Clutch Linings.
Diamond State Fibre Co.

Coaling Stations.
Chicago Bridge & Iron Works
Fairbanks, Morse & Co.

Compromise Joints.
Bethlehem Steel Company.
Rail Joint Company.

Condensers.
Ingersoll-Rand Co.

Conduits.
Diamond State Fibre Co.

Corrugated Iron.
Armco Culvert & Flume Mfrs. Assn.

Crossings, Highway Bituminous.
Headley Good Roads Co.

Crossings, Rail.
Bethlehem Steel Company.
Kilby Frog & Switch Co.
Ramapo Ajax Corp.
Weir Frog Co.
Wm. Wharton, Jr., & Co.

Culverts.
Armco Culvert & Flume Mfrs. Assn.

Culvert Pipe, Concrete.
Massey Concrete Prod. Corp.

Curbing.
Massey Concrete Prod. Corp.

Cutting, Oxy-Acetylene.
Air Reduction Sales Co.

Derails.
Q & C Co.
Wm. Wharton, Jr., & Co.

Derrick Cars.
Maintenance Equipment Co.

Ditchers.
American Hoist & Derrick Co.
Erie Steam Shovel Co.
Jordan Co., E. F.
Osgood Co., The.

Drinking Fountains.
Murdock Mfg. & Supply Co., The

Dynamite.
E. I. du Pont de Nemours & Co.

Drill Steel, Rock.
Ingersoll-Rand Co.

Drop Forgings.
Bethlehem Steel Company.

Electric Light & Power Plants.
Fairbanks, Morse & Co.

Engines, Gasoline.
Fairbanks, Morse & Co.
Fairmont Gas Engine & Ry. Motor Car Co.
Maintenance Equipment Co.
Mudge & Co.
New Way Motor Co., The
North American Engine Co.
Woolery Machine Co.

Engines, Hand Car.
Fairbanks, Morse Co.
Fairmont Gas Engine & Ry. Motor Car Co.
Maintenance Equipment Co.
Mudge & Co.
North American Engine Co.
Woolery Machine Co.

Explosives.
E. I. du Pont de Nemours & Co.

Fans.
Fairbanks, Morse & Co.
Fairmont Gas Engine & Ry. Motor Car Co.
Maintenance Equipment Co.
Mudge & Co.

Fence Posts.
Massey Concrete Prod. Corp.

Filters.
American Water Softener Co.

Flangers, Snow.
Q & C Co.

Float Valves.
American Valve & Meter Co.

Flux.
Air Reduction Sales Co.

Forgings.
Bethlehem Steel Company.

Forge Hammers.
Sullivan Machinery Co.

Frogs.
Bethlehem Steel Company.
Frog, Switch & Mfg. Co.
Kilby Frog & Switch Co.
Ramapo Ajax Corp.
Weir Frog Co.
Wm. Wharton, Jr., & Co.

Gages, Measuring.
Lufkin Rule Co., The.

Gages, Pressure, Gas.
Air Reduction Sales Co.

Gas, Acetylene.
Air Reduction Co., Inc.

Gas Engines.
New Way Motor Co., The

Gears.
Diamond State Fibre Co.

Generators, Acetylene.
Air Reduction Sales Co.

Girder Rail.
Bethlehem Steel Company.

Graders, Elevating.
Western Wheeled Scraper Co.

Graphite.
Dixon Crucible Co., Joseph

Grinders (Portable).
Ingersoll-Rand Co.

Guard Rails.
Bethlehem Steel Company.
Ramapo Ajax Corp.
Wm. Wharton, Jr., & Co.

Guard Rail Clamps.
Q & C Co.
Ramapo Ajax Corp.
Weir Frog Co.

Hand Cars.
Fairmont Gas Engine & Ry. Motor Car Co.
Fairbanks, Morse & Co.
Mudge & Co.

Hand Car Engines.
Fairmont Gas Engine & Ry. Motor Car Co.
Woolery Machine Co.

Hammer Drills.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Heaters, Feed Water.
American Water Softener Co.

High Tee Rail.
Bethlehem Steel Company.

Hose.
Air Reduction Sales Co.

Hydrants, Self-Closing.
Murdock Mfg. & Supply Co., The

Hydrants, Fire.
Murdock Mfg. & Supply Co., The

Insulated Rail Joints.
Bethlehem Steel Co.
Rail Joint Co.

Junction Boxes.
Massey Concrete Prod. Corp.

Jacks.
Fairbanks, Morse & Co.
Verona Tool Works.

Lights, Portable Flood.
Blake Mfg. Co., The

Lock Washers.
National Lock Washer Co.
Reliance Mfg. Co.

Lubricants.
Joseph Dixon Crucible Co.

Machinery.
Bethlehem Steel Company.

Machinery, Grading.
Western Wheeled Scraper Co.

Machinery, Oxy-Acetylene Welding and Cutting.
Air Reduction Sales Co.

Manganese Track Work.
Bethlehem Steel Company.
Kilby Frog & Switch Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr., & Co.

Manholes.
Massey Concrete Prod. Corp.

Marine Engines
New Way Motor Co., The

Markers.
Massey Concrete Prod. Corp.

Metal Protection, Paints.
Eagle-Picher Lead Co., The
Joseph Dixon Crucible Co.
New Jersey Zinc Co.
Texas Co., The.

Mile Posts.
Massey Concrete Prod. Corp.

Motor Cars.
Fairbanks, Morse & Co.
Fairmont Gas Engine & Ry. Motor Car Co.
Indiana Piston Ring Co.
Maintenance Equipment Co.
Mudge & Co.
Northwestern Motor Car Co.
Woolery Machine Co.

Motors, Portable.
New Way Motor Co., The

Nitrogen.
Air Reduction Co., Inc.

Nut Locks.
National Lock Washer Co.
Reliance Mfg. Co., The.
Selflock Nut & Bolt Co.
Verona Tool Works

Nuts.
Bethlehem Steel Company.

Oils.
Texas Co., The.

Oil Engines.
Bethlehem Steel Company.
Fairbanks, Morse & Co.
Ingersoll-Rand Co.

Oil Houses.
Massey Concrete Prod. Corp.

Out Houses.
Massey Concrete Prod. Corp.

Outfit, Welding.
Air Reduction Sales Co.

Oxy-Acetylene Welding
Air Reduction Sales Co.

Oxygen.
Air Reduction Sales Co.

Paints.
Eagle-Picher Lead Co., The
Joseph Dixon Crucible Co.
New Jersey Zinc Co.
Ruberoid o., The.
Texas Co., The.

Pavement Breakers.
Ingersoll-Rand Co.

Pencils.
Dixon Crucible Co., Joseph

Penstocks.
American Valve & Meter Co.

A metal protective paint that won't harden or "liver" in the container

EVERY MAN who has had any practical experience with rust-proofing paints knows what a nuisance and waste it is for paint to harden or "liver" in the container. Once the paint has hardened after being mixed in oil, there is nothing to do but throw it away.

You can avoid this waste by using PICHER SUBLIMED BLUE LEAD.

Chemists have determined that such hardening of paint will take place when "free" litharge is present in the pigment. If such pigment, after being mixed with oil, is allowed to stand, the litharge chemically reacts with the oil, resulting in this premature and wasteful hardening of the paint.

SUBLIMED BLUE LEAD, too, contains a considerable proportion of litharge which is believed to contribute substantially to its rust-proofing qualities. But, in SUBLIMED BLUE LEAD, the litharge is already chemically combined with other elements in the pigment.

So that when PICHER SUBLIMED BLUE LEAD is mixed with oil, the litharge cannot combine with the oil, no matter how long the paint is left to stand. Premature hardening of the paint is impossible.

PICHER SUBLIMED BLUE LEAD won't "liver" in the container, either. The impalpable fineness of its particles—due to the *Subliming* process by which it is produced—is such that the pigment remains perfectly and permanently suspended in the oil.

By actual exposure, and periodical inspection, for six years, the American Society for Testing Materials in its Atlantic City tests proved PICHER SUBLIMED BLUE LEAD to be the most efficient commercial rust-proofing paint of the 50 metal protective pigments subjected to the test.

But it is important for every paint buyer and paint user to know that the characteristics of PICHER SUBLIMED BLUE LEAD are so advantageous as to render this pigment not only uniquely efficient in its rust-proofing service, but especially economical in application. Get all the facts in our booklet "Buying Rust Protection".

Picher
SUBLIMED BLUE LEAD
What it is—What it does.

PICHER SUBLIMED BLUE LEAD is a "fume product"—made by subliming the lead ore, galena (lead sulphide) and collecting the fumes. The pigment thus produced is a slate gray powder, of impalpable fineness, which when mixed with pure linseed oil produces a paint of remarkable hiding power and exceptional brushing and spreading qualities, which will endure years of exposure in service, without cracking, checking or peeling. This pigment remains perfectly suspended in oil and will not harden in the container.

Low in first cost and of the highest efficiency in service, PICHER SUBLIMED BLUE LEAD will be found the best paint to use for all rust-proofing purposes.

The EAGLE-PICHER LEAD COMPANY

208 SOUTH LA SALLE STREET, CHICAGO

Cincinnati, New York, Philadelphia, Detroit, Pittsburgh, Cleveland, St. Louis, Kansas City, Joplin, Baltimore, Buffalo, Minneapolis, New Orleans

Picher Sublimed Blue Lead *in Oil*

90% of PURE blue lead ground in 10% of PURE raw linseed oil

O220-10

BUYERS' GUIDE

Pig Iron.
Bethlehem Steel Company.

Piling.
International Creosoting & Construction Co.
Massey Concrete Prod. Corp.

Pinions.
Diamond State Fibre Co.

Pipe, Cast Iron.
McWane Cast Iron Pipe Co.

Pipe, Concrete.
Massey Concrete Prod. Corp.

Pipe, Corrugated, Rolled.
Armco Culvert & Flume Mfrs. Assn.

Pipe Carriers.
Massey Concrete Prod. Corp.

Pipe Joint Compound.
Dixon Crucible Co., Joseph

Plants, Welding and Cutting.
Air Reduction Sales Co.

Plows, Railroad.
Western Wheeled Scraper Co.

Pneumatic Tie Tampers.
Ingersoll-Rand Co.

Pneumatic Tools.
Ingersoll-Rand Co.

Poles.
International Creosoting & Construction Co.
Massey Concrete Prod. Corp.

Powders.
E. I. du Pont de Nemours & Co.

Power Houses.
Massey Concrete Prod. Corp.

Preservative, Timber.
International Creosoting & Construction Co.
New Jersey Zinc Co.

Producers, Gas.
Air Reduction Sales Co.

Pumps.
American Well Works.
Fairbanks, Morse & Co.
Goulds Mfg. Co., The.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Push Cars.
Fairbanks, Morse & Co.

Rails.
Bethlehem Steel Co.
Inland Steel Company.

Rail Anchors.
P. & M. Co., The.

Rail Anti-Creepers.
P. & M. Co., The

Rail Braces.
Bethlehem Steel Company.
Louisville Frog & Switch Co.
Q & C Co.
Ramapo Ajax Corp.
Weir Frog Co.

Rail Joints.
Bethlehem Steel Co.
Inland Steel Co.
Q & C Co.
Rail Joint Co.
Wm. Wharton, Jr., & Co.

Rail Saws.
Fairbanks, Morse & Co.
Q & C Co.

Rare Gases.
Air Reduction Sales Co.

Regulators, Oxy-Acetylene.
Air Reduction Sales Co.
Mudge & Co.

Removers, Paint & Varnish.
Mudge & Co.

Replacers, Car.
Q & C Co.

Riveting Hammers.
Ingersoll-Rand Co.
Verona Tool Works.

Rivets.
Bethlehem Steel Company.

Rock Drills.
Ingersoll-Rand Co.
Sullivan Machinery Co.
Verona Tool Works.

Rods, Welding.
Air Reduction Sales Co.

Roof Slabs.
Massey Concrete Prod. Corp.

Roofing, Asbestos.
Robertson Co., H. H.

Roofing Corrugated.
Robertson Co., H. H.

Roofing and Siding.
Fairbanks, Morse & Co.
Robertson Co., H. H.

Rules.
Lufkin Rule Co., The.

Saws, High Speed Friction.
American Saw Mill Co.

Scrapers, Wheeled, Drag & Buck.
Western Wheeled Scraper Co.

Screw Spike Drivers.
Ingersoll-Rand Co.

Sewer Pipe.
Massey Concrete Prod. Corp.

Sheets, Corrugated.
Robertson Co., H. H.

Sheets, Fibre.
Diamond State Fibre Co.

Sheet Iron.
Armco Culvert & Flume Mfrs. Assn.

Sheet Steel.
Inland Steel Company.

Shovels.
Wood Shovel & Tool Co., The.

Siding, Corrugated & Plain.
Robertson Co., H. H.

Signal Foundations, Concrete.
Massey Concrete Prod. Corp.

Skid Shoes.
Q & C Co.

Skylights.
Robertson Co., H. H.

Slabs, Concrete.
Massey Concrete Prod. Corp.

Smoke Stacks.
Chicago Bridge & Iron Works.
Massey Concrete Prod. Corp.

Snow Melting Devices.
Q & C Co.

Snow Plows.
Q & C Co.

Spikes.
Bethlehem Steel Company.
Inland Steel Co.

Spreaders.
Jordan Co., E. F.

Standard Tee Rails.
Bethlehem Steel Company.
Inland Steel Co.

Standpipes.
American Valve & Meter Co.
Fairbanks, Morse & Co.

Station Houses.
Massey Concrete Prod. Corp.

Steam Shovels.
American Hoist & Derrick Co.
Erie Steam Shovel Co.
Osgood Co., The.

Steel Forms.
Blaw-Knox Co.

Steel Plates and Shapes.
Bethlehem Steel Company.

Step Joints.
Q & C Co.
Rail Joint Co.

Street Railway Special Work.
Bethlehem Steel Company.

Structural Steel.
Bethlehem Steel Company.
Inland Steel Company.

Switches.
Bethlehem Steel Company.
Frog, Switch & Mfg. Co.
Ramapo Ajax Corp.
Weir Frog Co.
Wm. Wharton, Jr., & Co.

Switch Locks.
American Valve & Meter Co.

Switchmen's Houses.
Massey Concrete Prod. Corp.

Switchstands and Fixtures.
American Valve & Meter Co.
Bethlehem Steel Company.
Fairbanks, Morse & Co.
Ramapo Ajax Corp.
Weir Frog Co.
Wm. Wharton, Jr., & Co.

Tampers.
Ingersoll-Rand Co.

Tanks, Elevated Steel.
Chicago Bridge & Iron Works.

Tanks, Oil Storage.
Chicago Bridge & Iron Works.

Tank Valves.
American Valve & Meter Co.

Tapes.
Lufkin Rule Co., The

Telegraph Poles.
International Creosoting & Construction Co.
Massey Concrete Prod. Corp.

Telephone Booths.
Massey Concrete Prod. Corp.

Ties.
International Creosoting & Construction Co.

Tie Plates.
Bethlehem Steel Company.
Inland Steel Company.
Lundie Engineering Corp.

Tie Rods.
Bethlehem Steel Company.

Tin Plate.
Bethlehem Steel Company.

Tongue Switches.
Bethlehem Steel Company.

Tool Steel.
Bethlehem Steel Company.

Tools, Oxy-Acetylene Welding and Cutting.
Air Reduction Sales Co.

Torches, Oxy-Acetylene Welding and Cutting.
Air Reduction Sales Co.

Track, Portable.
Western Wheeled Scraper Co.

Track Drills.
Ingersoll-Rand Co.

Track Insulation.
Diamond State Fibre Co.
Q & C Co.

Track Jacks.
Verona Tool Works.

Track Liners.
Crowley & Co., Thomas D.

Track Material.
Inland Steel Company.
Ramapo Ajax Corp.
Weir Frog Co.

Track Scales.
Fairbanks, Morse & Co.

Track Tools.
Fairbanks, Morse & Co.
Q & C Co.
Verona Tool Works.
Warren Tool & Forge Co.

Trestle Slabs.
Massey Concrete Prod. Corp.

Vacuum Pumps.
Ingersoll-Rand Co.

Varnish, Electrical Insulating.
Ruberoid Co., The.

Ventilators, Shop, Roundhouse
Robertson Co., H. H.

Washers.
Diamond State Fibre Co.

Water Column.
American Valve & Meter Co.

Water Softening Plants.
American Water Softener Co.

Waterproofing.
Ruberoid Co., The.

Welding, Oxy-Acetylene.
Air Reduction Sales Co.

Weed Killer.
Chipman Chemical Engineering Co., Inc.
Reade Mfg. Co.

Wheels (Hand and Motor Car).
Fairmont Gas Engine & Ry. Motor Car Co.
Maintenance Equipment Co.
Mudge & Co.
Woolery Machine Co.

Wire.
Armco Culvert & Flume Mfrs. Assn.

Wire Rope.
Fairbanks, Morse & Co.

Wood Preservative.
Chipman Chemical Engineering Co., Inc.
International Creosoting & Construction Co.
Reade Mfg. Co.

Zinc Chloride.
New Jersey Zinc Co.

ALPHABETICAL INDEX TO ADVERTISEMENTS

A
Air Reduction Sales Co. 8
American Valve and Meter Co. ... 13
American Water Softener Co. 14
American Well Works, The. 20
Armco Culvert and Flume Mfrs. Assn. 6
Associated Business Papers, Inc... 23

B
Bethlehem Steel Company. 22
Blake Mfg. Co., The. 28
Blaw-Knox Co. 24

C
Chicago Bridge & Iron Works. 4
Crowley & Co., Thomas D. 23

D
Diamond State Fibre Co. 29
Dixon Crucible Co., The Joseph... 20
Du Pont de Nemours Co., E. I.... 11

E
Eagle-Picher Lead Co., The. 31
Erie Steam Shovel Co. 25

F
Fairbanks, Morse & Co. 28
Fairmont Gas Engine and Ry. Motor Car Co. 9
Frog, Switch and Manufacturing Co., The 22

G
Goulds Manufacturing Co., The... 21

H
Headley Good Roads Co. 10

I
Indiana Piston Ring Co. 27
Ingersoll Rand Co. 18
Inland Steel Company. 21
International Creosoting and Construction Co. 14

J
Jordan Co., O. F. 21

K
Kilby Frog & Switch Co. 29

L
Lundie Engineering Corp. 29
Lufkin Rule Co., The. 26

M
McWane Cast Iron Pipe Co. 10
Maintenance Equipment Co. 33
Massey Concrete Products Corp... 27
Mechanical Mfg. Co. 16
Mudge & Co. 3
Murdock Mfg. & Supply Co., The.. 28

N
National Lock Washer Co., The.. 1
New Jersey Zinc Co., The. 19

O
Osgood Co., The. 16

Q
Q & C Co., The. 10

R
Rail Joint Co., The. 22
Ramapo Ajax Corp. 15
Reliance Mfg. Co., The. 2
Robertson, H. H., Co. 20

S
Selflock Nut and Bolt Co., Inc.... 17
Sullivan Machinery Co. 27

T
Texas Co., The. 24

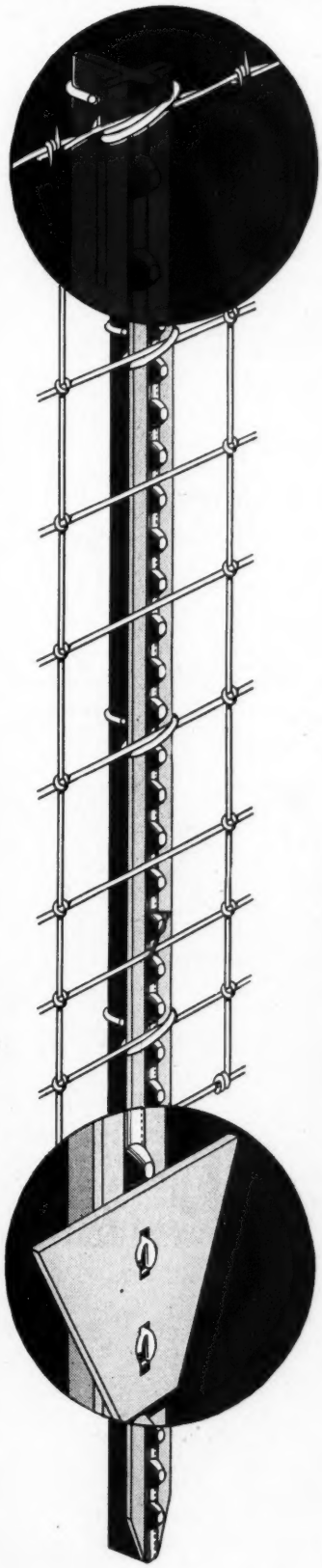
V
Verona Tool Works. 34

W
Weir Frog Co., The. 26
Western Wheeled Scraper Co. 26
Wharton & Co., Wm., Jr. 24
Woolery Machine Co. 20
Wood Shovel and Tool Co., The... 7

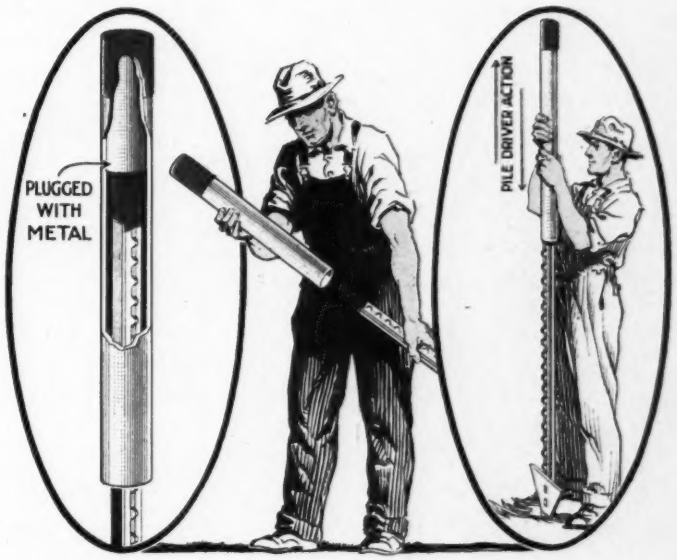
Red Top Studded Tee Steel Fence Post

(The Original) and

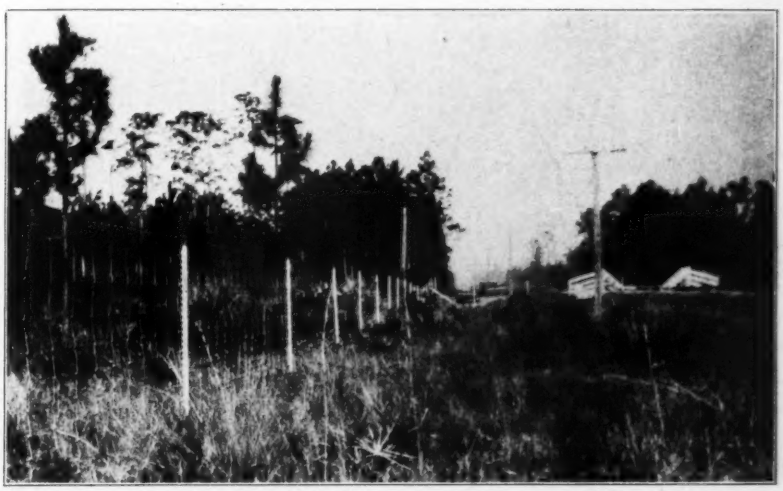
Red Top One-man Post Driver



This post is 25% stronger than any other form of Steel Posts



Using the "One-man Post Driver" these Red Top Studded Tee Posts were installed at less than one cent per post.



We shall be glad to furnish further information on the cost of building fence by using Red Top Studded Tee Posts and Red Top Dirt Set End and Corner Posts.

MAINTENANCE EQUIPMENT COMPANY

LABOR SAVING TRACK DEVICES

RAILWAY EXCHANGE :-: :-: :-: CHICAGO

RUST

CONSIDER just this one phase of the rust problem:

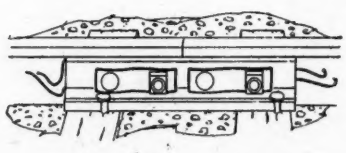
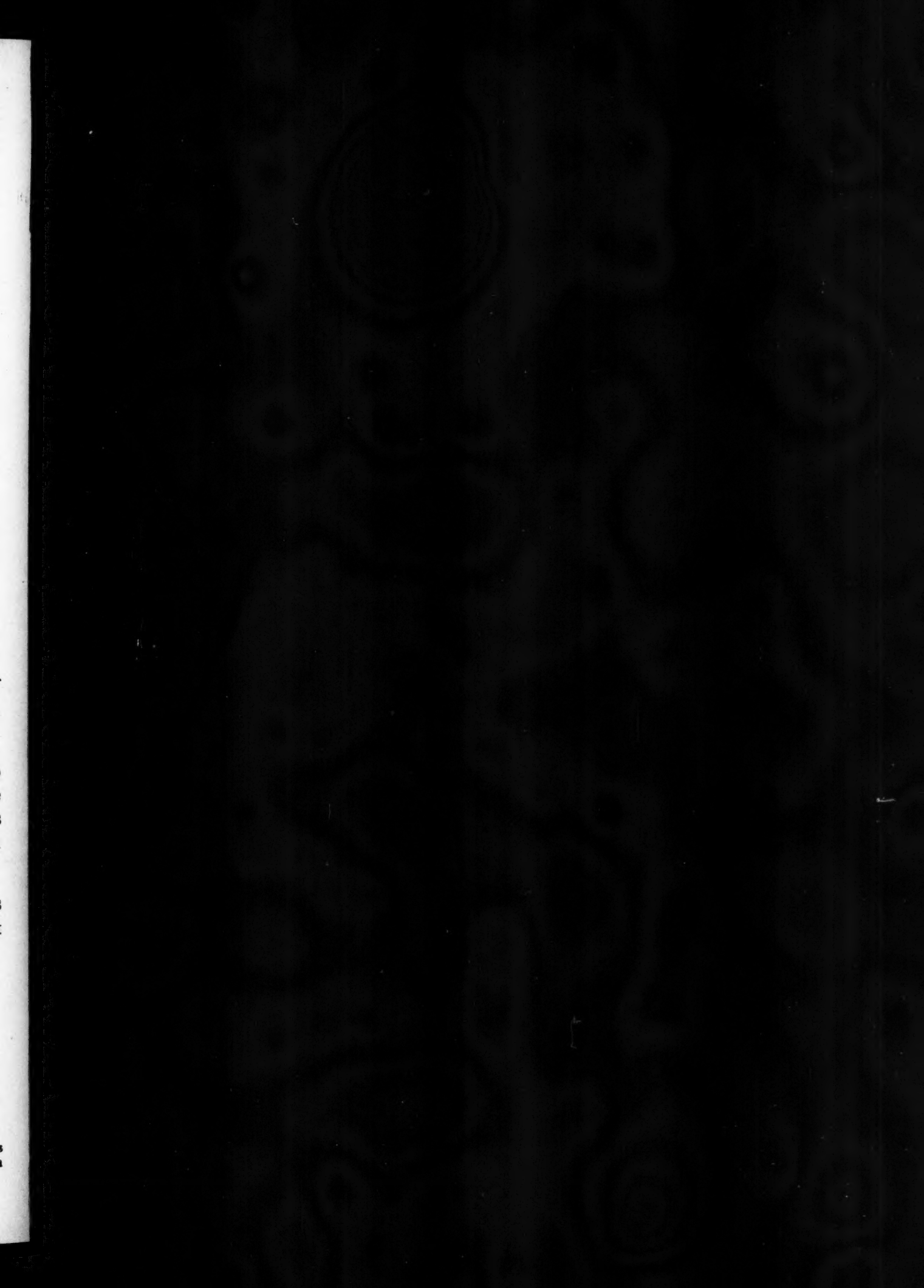
Rust makes loose rail joints.

Particles of rust on surfaces that rub one against the other easily wear off. When rust particles wear off track bolts, nuts, splice bars, or the rail itself, the joint becomes loose.

The Verona Rail Joint Spring does not prevent rust. It does, however, retard rust from loosening up the joints. The spring not only delivers many times the reactive pressure of an ordinary nutlock. It delivers it thru a much greater distance as well.

Thus, when rust particles have worn off to such an extent that a nutlock's pressure would be negligible, the spring still delivers six times the reactive pressure of a nutlock that is fully compressed.

The Verona Rail Joint Spring makes joints tight—and despite stretch or wear or rust, it ***keeps*** them tight.



VERONA TOOL WORKS Pittsburgh New York Chicago Boston St. Louis San Francisco New Orleans Montreal Washington